

# AAI AUTOMOTIVE INDUSTRIES

**AUTOMOTIVE and AVIATION MANUFACTURING  
ENGINEERING • PRODUCTION • MANAGEMENT**

**AUGUST 1, 1958**

## ***In This Issue***

**Automated Production of Power Steering  
Newest Russian Trucks at Brussels Fair  
Special Tooling for Tractor Crankshafts  
Highlights of Industry Missile Conference  
Titanium Cases for Jet Engine Compressors  
Second Part of Automotive Plastics Survey**

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**A C H I L T O N   P U B L I C A T I O N**

# NEW from Standard Oil

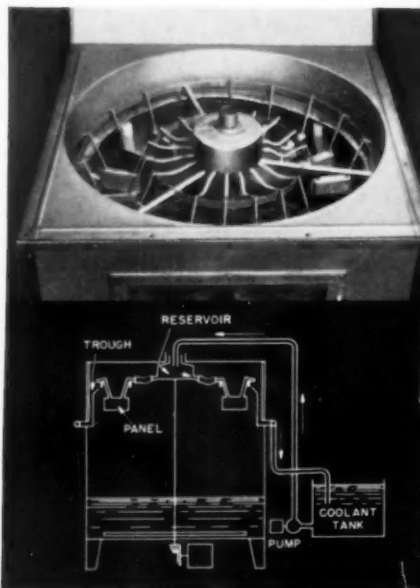
Corrosion steals \$5.5 billion from industry annually. Standard Oil is in the forefront of the fight to control this loss. Standard's research scientists have developed a new method for measuring the effectiveness of rust preventives. This new test takes less than one-twentieth of the time of previous tests—and is about three times as precise.

Using a controlled humidity cabinet for testing corrosion, these Standard research men installed a system for cooling metal test panels (previously treated with rust preventive) so that their surface temperatures are lower than the temperature in the cabinet. Temperatures of panel surfaces and of cabinet atmosphere are held accurately. Controlling the temperature of the panels controls the rate at which water condenses on them. This in turn (for the first time) permits accurate control of the amount of condensation on the panels. Rust preventives are more speedily and precisely tested. Science, as a result of this work, has a new tool with which to test corrosion.


This is the research pay-out industry receives from Standard Oil. This is the something extra that backs up the Standard industrial lubrication specialist who calls on you. This is the something extra found in the products he sells.

To know more about how Standard Oil industrial lubrication specialists—and Standard's research program—can help you, call the Standard Oil office nearest you in any of the 15 Midwest and Rocky Mountain states. Or write, Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

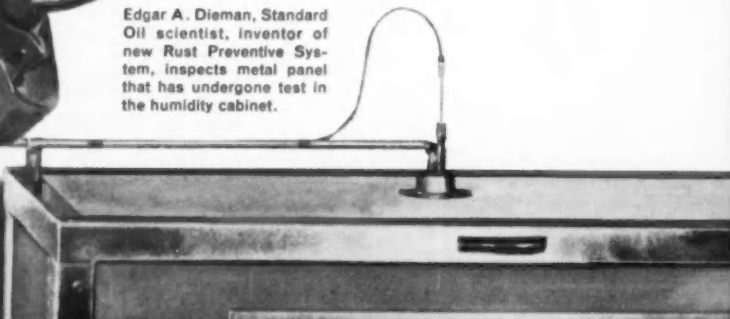
## THE MAGIC BOX



Top view and cross section of Accelerated Condensation Corrosion Test cabinet.

You expect more from  and get it!

Edgar A. Dieman, Standard Oil scientist, inventor of new Rust Preventive System, inspects metal panel that has undergone test in the humidity cabinet.



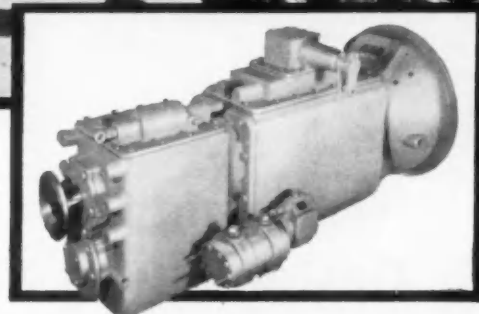
# Oil well fracturing... another new **big** job for COTTA HEAVY-DUTY TRANSMISSIONS



The newest of the new breed of diesel giants—trailer-mounted oil well fracturing rigs—produced by BJ Service, Inc., consists of a pair of 600 hp engines coupled to two 10,000 psi pumps through two Heavy-Duty Cotta Transmissions.

When big power moves into a new job, a Heavy-Duty Cotta Transmission is often the one best answer to speed-change problems.

That's what BJ Service, Inc., Long Beach, California, found in developing their biggest and newest version of the dieselized oil well fracturing unit. Fracturing, the operation in which a huge gallonage of liquid, mixed with sand, is injected into an ailing oil well to break the oil formation, requires near-explosive force. Big hydraulic horsepower is so much a requirement that as many as half a dozen giants like the one shown above may be combined to concentrate up to 5,000 hp on a single job.



Whether you have the problem of conveying the *greatest possible* horsepower to a given operation or just *big* horsepower, you can count on Cotta for the tough, smooth-operating transmission you need. Dependable Cotta transmissions and gear reducers are built by *specialists* in heavy-duty power problems. Cotta offers you a wide range of standard transmissions and reducers with input torque ranging from 150 to 2,000 ft lb... or design service on exactly the "engineered-to-order" unit your special job requires.

## THIS INFORMATION WILL HELP YOU

Sent free on request—diagrams, capacity tables, dimensions, and complete specifications. State your problem—COTTA engineers will help you select the right unit for best performance. Write today.

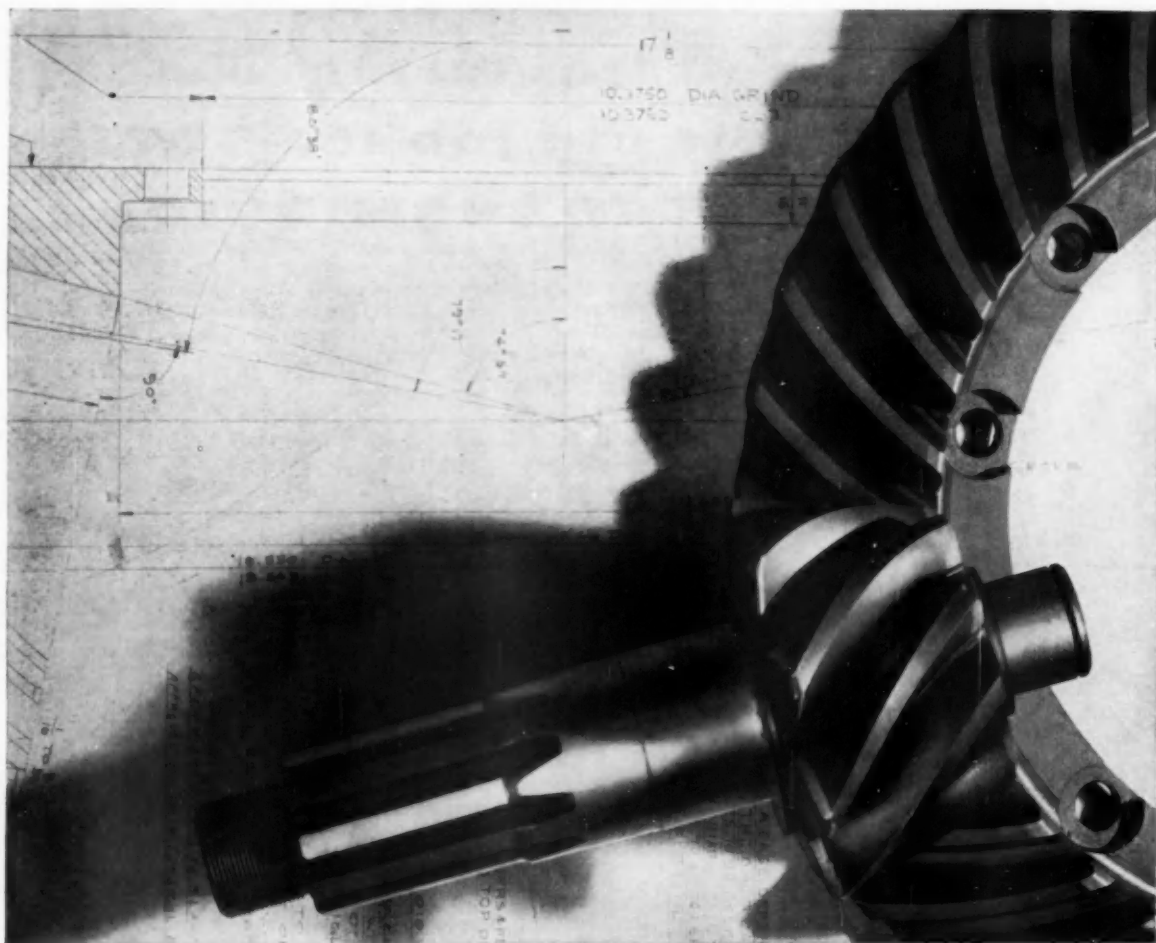
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



# COTTA

HEAVY-DUTY  
TRANSMISSIONS

"Engineered-to-order"



## New big heavy-duty truck gear! Design based on 4820 Ni-Mo Steel

A new rear axle assembly for high output engines is now being produced by the White Motor Company.

It embodies all the advantages of a single reduction unit: simpler construction, lighter weight, shorter length.

Key element in this compact design is a big, 18½-inch ring gear — one of the largest ever made for a rear axle of this type.


### Carburized 4820 Ni-Mo Steel just right for gear

AISI Type 4820 (3.5% Nickel) gives this big gear its ability to cushion shock...take high tooth pressure...

drive a gross combination weight of 180,000 pounds over mountainous terrain.

Type 4820 is one of many nickel-containing steels that offer a wide range of properties for improving the durability of heavy-duty axle components. These steels provide the strength, toughness, and other properties needed for a specific job.

For information to help you select the best alloy steel for your needs, get in touch with Inco's Development & Research Division.

THE INTERNATIONAL NICKEL COMPANY, INC.  
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Lightweight, high-torque capacity rear axle Model 134C — Built by the White Motor Company, Cleveland. Unit has a full range of ratios, permits top road speeds with low RPM engines.

# INCO NICKEL

NICKEL MAKES CASTINGS PERFORM BETTER LONGER



# AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE PUBLISHED SEMI-MONTHLY

AUGUST 1, 1958

VOL. 119, NO. 3

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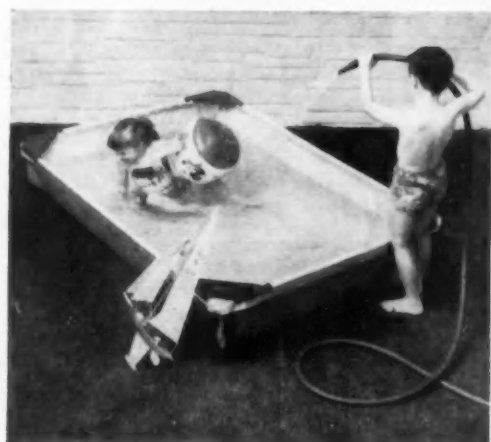
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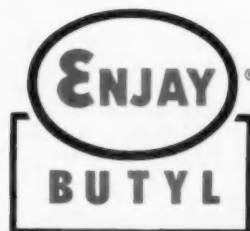
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Soft spot  
for old  
machines  
?

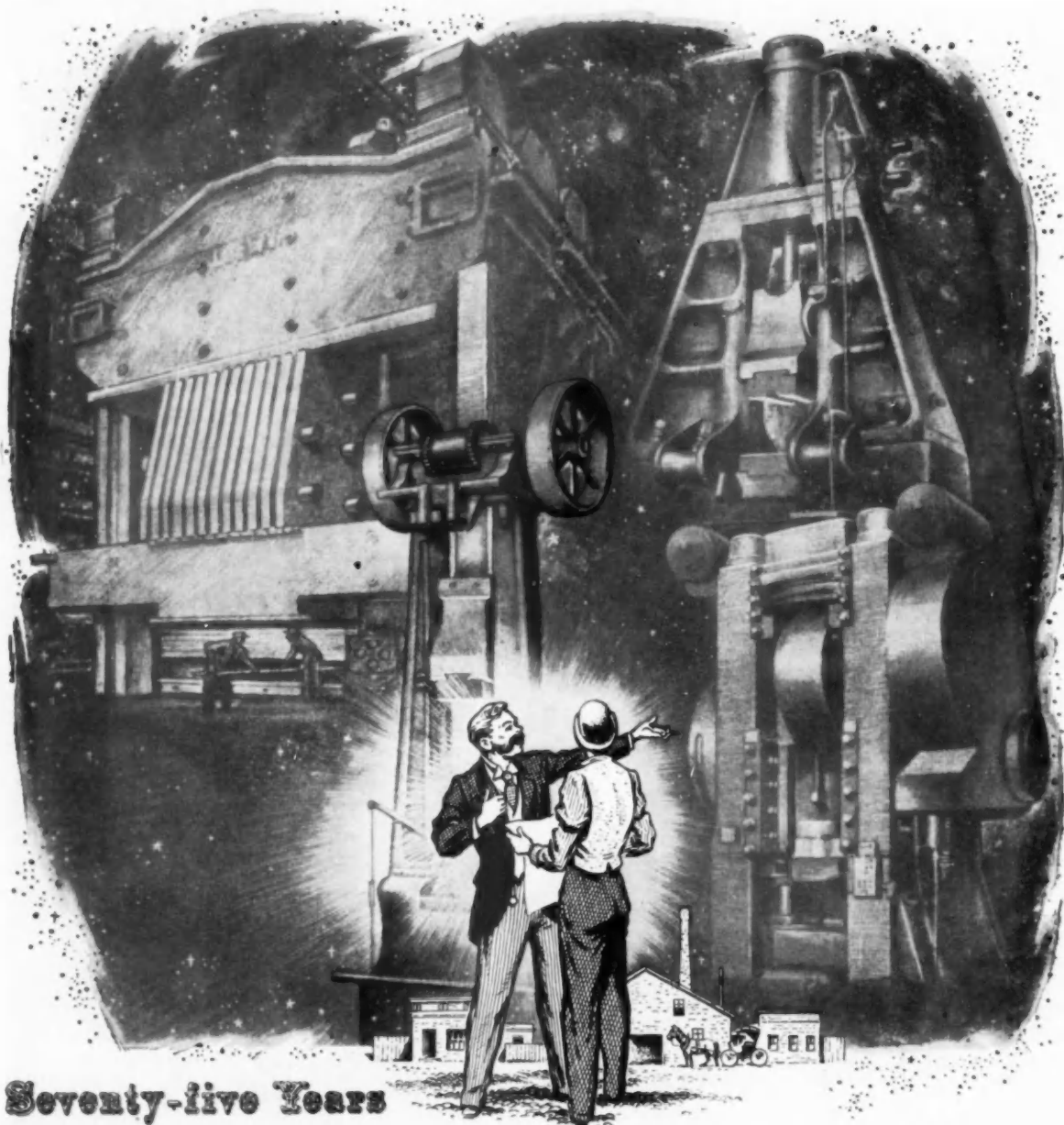
*Soft spot  
in profits too?*

*Talk to*

*Snyder*

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## Seventy-five Years

**T**HERE WAS a growing surplus in the United States Treasury—the Polygamy Act was passed—letter postage was reduced from three cents to two cents—the Brooklyn Bridge was opened—standard time was adopted—in 1883, when two young men, just graduated from Worcester Polytechnic Institute, established the business bearing their names—WYMAN-GORDON. The total capital was \$27,000.

Integrity, initiative, ambition and ability were theirs. Endowed with these qualities and privileged to operate

under that unique American system of free, private, competitive enterprise the Company prospered and grew.

On this our 75th anniversary, we salute the spirit of our founders and we pledge our every effort to help preserve, against the steady erosion of the last quarter century, that system which has made our nation what it is today and which has enabled us to build the greatest industrial production in the world, resulting in the highest standards for all segments of our people.

# WYMAN-GORDON COMPANY

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DETROIT, MICHIGAN

# Technical data for gasket design and selection

NUMBER FOUR

## Why close tolerances in resilient gaskets are rarely necessary

Tolerances in the size and shape of a gasket do not become critical if the gasket material chosen seals effectively over a wide range of compressions.

The typical examples shown here illustrate how Armstrong cork-and-rubber materials help eliminate the need for close tolerances.

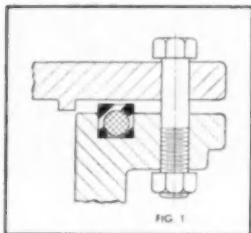
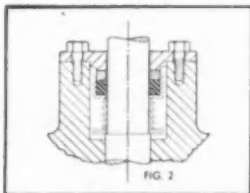


Figure 1 shows relative sizes of a resilient cork-and-rubber gasket and a non-compressible molded ring. The ring must meet very close tolerances to allow flange contact and achieve a seal.

In figure 2, wide tolerance cork-and-rubber gaskets make an effective packing ring. True compressibility controls lateral flow and prevents excessive build-up of radial pressure on the shaft.



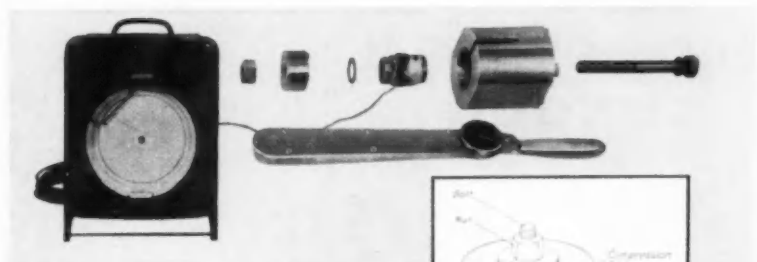
Armstrong cork-and-rubber compounds seal tightly under compressions ranging from 20% to 33%. Because they are truly compressible, they decrease in volume under load, so tolerances in size may be as wide as .010", even in completely confined space.

## How varying bolt efficiencies affect flange loads, cause gasket leakage

Leaks often occur in gasketed joints where flange loads as calculated are thought to be adequate—or more than adequate—to create a seal. Such leaks are sometimes blamed on torque loss, when the real problem is inadequate initial flange pressure.

loads that approach the values calculated from bolt torque.

Data obtained with this device has led to a method of relating apparent flange pressures to actual flange pressures. This procedure compensates for



Studying efficiency of  $\frac{1}{2}$ -11NC bolt. The bolt is inserted from bottom of housing and load sensing transducer slipped over with its wires leading through keyway to recorder. Keyed compression ring is then fitted on, and the nut is torqued. Variations in loading for a given torque, caused by friction on threads and bolt head, are traced by the recorder.

The major reason is that flange loads arrived at mathematically almost never equal the true load on the gasket. The explanation is friction . . . friction on threads and bolt heads that soaks up torque and reduces the pressure available to squeeze the gasket.

Although it is generally known that friction causes variations in bolt efficiency, little data has been available to indicate the extent of the problem. As a result, arbitrary compensations for friction are usually too low.

Armstrong research engineers have developed a device (shown above) which measures the effect on bolt efficiencies of varying screw thread conditions. Dry or rough threads, for example, give low bolt efficiencies which develop actual gasket loads much lower than torque readings would indicate. Lubricated threads give high bolt efficiency and result in gasket

varying conditions of bolt threads.

This data, combined with other new information on seal points of Armstrong resilient gasket materials, is useful in helping designers meet the minimum sealing conditions of a particular flange design and material.

Detailed information on this subject and other problems of gasket selection, design, and performance is contained in the new Armstrong Gasket Design Manual. Write for your personal copy.

**New! Gasket Design Manual** just printed. Write for a copy to Armstrong Cork Company, Industrial Division, 7508 Imperial Avenue, Lancaster, Penna.



## Armstrong GASKET MATERIALS

... used wherever performance counts



# For greater selling impact.

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SEAT  
and  
SHROUD



from  
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The Moto-Mower Division of Detroit Harvester Co. designed a colorful, comfort-molded seat and a light-weight, long-lasting shroud for its Moto-Mower Power Lawn Mower. Replacing costly, heavier metal in these particular applications, Cycylac was greatly responsible for the development of a lighter-in-weight power lawn mower . . . a more economical-to-manufacture, easier-to-sell unit, designed to take severe use and abuse in dependable stride.

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## 2 Giant Waldes Truarc Beveled Rings Cut Costs \$500, Save 76½ Hours Machining-Assembly Time on X-Ray Unit

### TRIPLETT & BARTON TRI-IND-X PORTABLE X-RAY UNIT

OLD MODEL



NEW MODEL



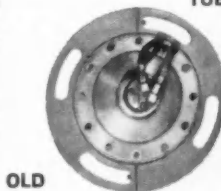
#### OLD SPECIFICATIONS

#### NEW SPECIFICATIONS

Weight	107 lbs.	65 lbs.
Diameter	15 inches	11 inches
Machining and Assembly Time	78 hours	1½ hours
Service Time	4½ hours	5 minutes
Parts	27 bolts	2 Truarc Rings

Prior to adoption in their new bantam-weight TRI-IND-X, Triplett & Barton, Inc., Burbank, Calif., subjected Waldes Truarc Retaining Rings to severe tests and rigid inspections. Although the TRI-IND-X operates at a normal pressure of 50 psi, Truarc Rings were subjected to pressure tests in excess of 500 psi, proving their high performance.

### TUBE END ASSEMBLY



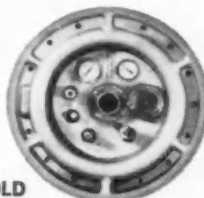
OLD



NEW

**ONE 10" BEVELED RING REPLACES 12 BOLTS**—Machining and assembly time formerly required 78 hours ... now reduced to 1½ hours! Service operations for dismantling or tube change formerly required 4½ hours ... now reduced to 5 minutes! In addition to savings on materials, costs have been reduced approximately \$500 per unit.

### END BELL ASSEMBLY



OLD



NEW

**ONE 9" BEVELED RING REPLACES 15 BOLTS**—In addition to functioning as mechanical fasteners, the Truarc Beveled rings serve as pressure vessel closures, providing leak-proof seals. The wedge action of the ring compensates for wear, provides a constant tight seal.

Whatever you make, there's a Waldes Truarc Ring designed to save you material, machining and labor costs, and to improve the functioning of your product.

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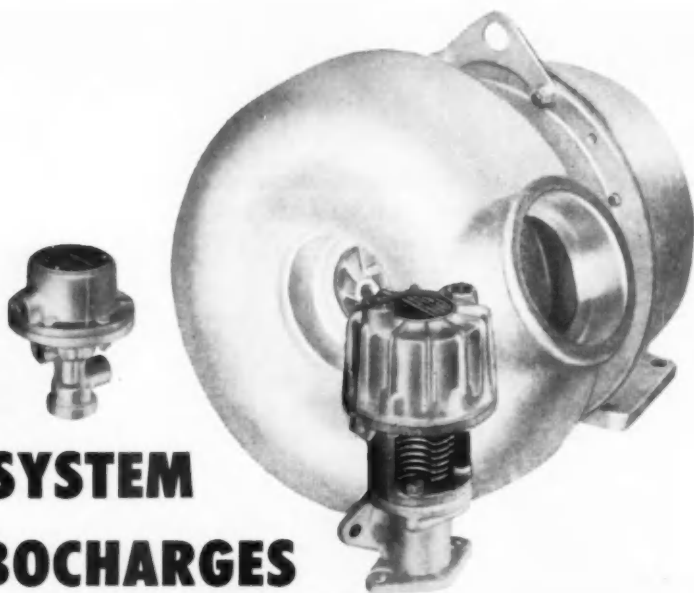
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**SUPER-TURBOCHARGES**  
**CATERPILLAR DW20 AND DW21 TRACTORS**



New AiResearch Pressure Ratio Controls *substantially increase lugging ability and travel speed* of Caterpillar DW20 and DW21 Wheel Tractors equipped with AiResearch T-15 Turbochargers.

The new control unit more than doubles the torque rise, giving the tractor greater lugging ability when operating under heavy loads. Accurate control of turbocharger speed over a wide range allows the engine to operate effi-

ciently regardless of its changing load requirements.

This further improves other performance characteristics: *decreases specific fuel consumption ... improves acceleration ... provides cooler engine operating temperatures ... reduces smoking.* The improved air induction system also provides equal rimpull for the new DW20 and DW21 at 10% higher travel speeds.

The two components of the new

AiResearch Pressure Ratio Control unit are a pressure ratio sensor and exhaust by-pass valve. They allow the turbocharger to operate at maximum boost pressure over a wide range of engine speeds and operating conditions, thus maintaining turbocharger speed, and hence engine air input, at higher levels while lugging. This improves the overall performance match of a free-floating turbocharger.

Your inquiries are invited.

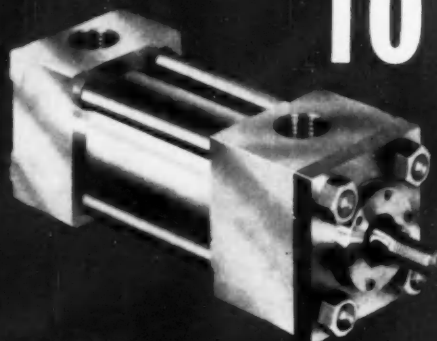


**AiResearch Industrial Division**

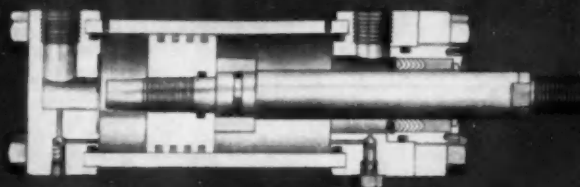
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Vee type, non adjustable, self compensating, rod gland packing provides multiple lip seal. Cartridge "O" ring, with leather back up furnishes a positive

seal. Rod wiper or interchangeable metallic scraper prevent dirt from entering cylinder on "in" stroke. A complete selection of mounts is available.

*These and many other features are described in detail in our latest catalog No. 105. Write for your copy TODAY or consult your local O-M representative.*

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ARMASTEEL 88M has been developed to fill the automotive industry's needs for a material having increased wear resistance and high yield strength, yet at the same time retaining good machine characteristics.

ARMASTEEL 88M does not require heat treating and thus relieves customer facilities or eliminates capital expenditures. In many parts, distortion is a problem after heat treating. Parts made from ArmaSteel 88M can be machined without further heat treatment and still give good wear resistance.

This new castable metal is a pearlitic malleable iron which possesses substantially the same strength and the same wear characteristics as alloy steel forgings. Being a castable material, it has the two advantages of design flexibility and good machinability. Why 88M possesses these characteristics—and how it will fill the needs of American industry will be of interest to manufacturers and engineers in many fields . . .

PRODUCTION OF 88M—By accurately controlling

*Universal Joint Yoke*



the heat-treatment of ArmaSteel 88M in controlled atmosphere furnaces at 1750° for approximately 15 hours, all massive carbides are removed. This heat treatment is followed by closely controlled oil quench and tempering operations to provide a narrow range of hardness.

Surface hardening of ArmaSteel, if desired, does not require carburizing. Instead, flame-hardening, induction-hardening or simple immersion methods may be used. A surface hardness of 50 Rockwell C to 60 Rockwell C can be readily obtained. Wear-resistant properties in the hardened area are comparable and sometimes better than carburized steel, while the remaining sections retain their original toughness.

**MACHINABILITY**—In addition to performance characteristics, ArmaSteel offers good machinability. Carbon spots that are present in the Matrix of ArmaSteel allow the chips to break off readily, effectively reducing machining time and prolonging tool life. In comparative tests, ArmaSteel shows itself to be a more freely-machining material than steel bar stock or forgings of the same Brinell hardness.

Because of its ability to assume the shape of practically any molded cavity, 88M not only permits great

*Automatic Transmission Planet Gear Carrier*





## PEARLITIC MALLEABLE IRON?

# 88 M *developed by*

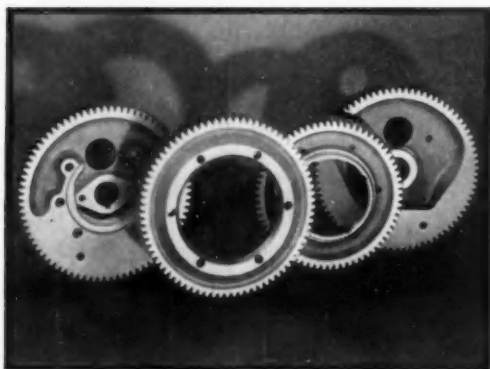
## CENTRAL FOUNDRY DIVISION

freedom in design but also possesses certain inherent physical characteristics not present in forgeable alloys.

**APPLICATIONS**—ArmaSteel 88M is now being cast for automatic transmission planet gear carriers and universal joint yokes for leading automobile manufacturers. Other interesting applications now in the testing stage include transmission output shafts, and diesel engine idler, balance and crankshaft gears.

Just what hundreds of other applications are in store for 88M is still anyone's guess. But the more one examines its characteristics, the more it would seem that it will fill many needs in many types of products and industries. In your products, for example, you

*Diesel Engine Idler, Balance and Crankshaft Gears*



*Transmission Output Shaft*



may well see where 88M could both improve performance of components subject to great wear or great stress, and at the same time reduce final cost because of the economy in casting and the economy in a material with superior machining characteristics.

**CASTING**—Parts are cast in ArmaSteel 88M, here at Central Foundry Division, in either standard greensand molds or the newer, more precise shell-molds. In addition to 88M, Central Foundry Division produces castings, on a volume basis, in grey iron, alloy grey iron, malleable iron, and ARMASTEEL 84M, 85M and 86M.

Our research facilities and engineering staff are prepared to help you determine whether 88M or any of the other materials now being cast at Central Foundry will fill your needs or help you reduce your over-all product cost.

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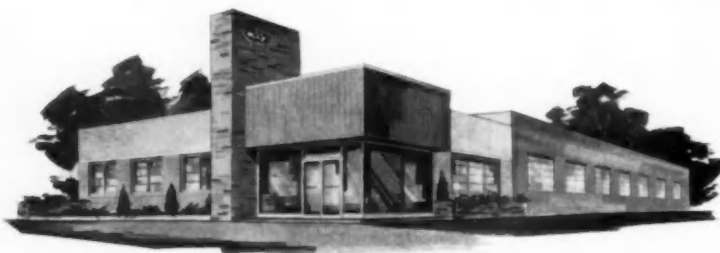
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AUTOMOTIVE INDUSTRIES, August 1, 1958

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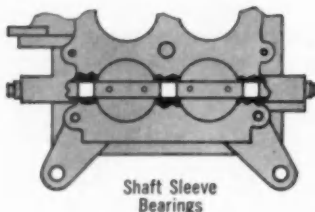
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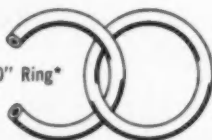


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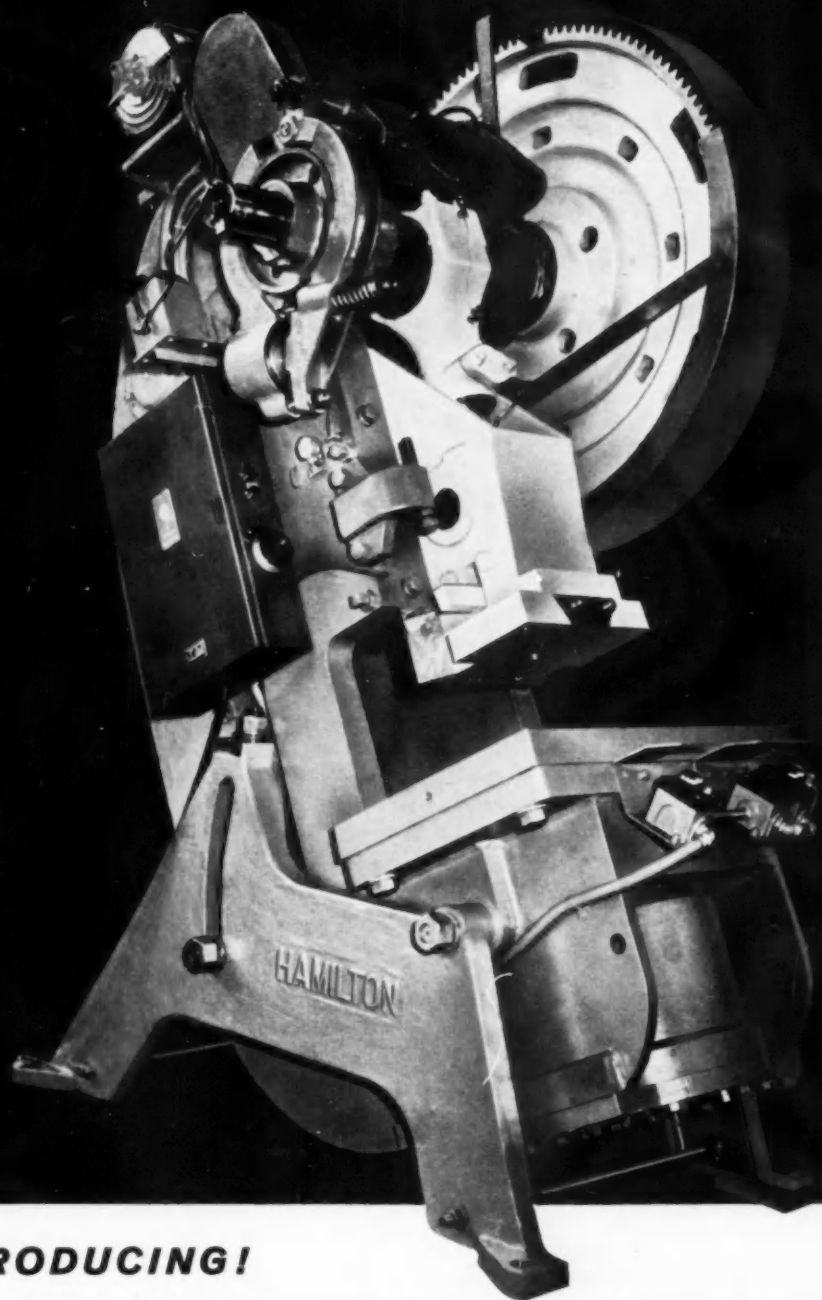
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## CALENDAR

OF COMING SHOWS AND MEETINGS

- American Society for Quality Control, Western Region annual conference, El Cortez Hotel, San Diego, Calif. ....Aug. 7-8
- SAE National West Coast Meeting, Ambassador Hotel, Los Angeles, Calif. ....Aug. 11-14
- American Petroleum Institute, OIC Steering Committee meeting, Hotel Statler, Boston, Mass. Aug. 14
- American Astronautical Society, Inc., Annual Western Regional Meeting, Stanford University, Dinkelspiel Auditorium, Palo Alto, Calif. ....Aug. 18-19
- Joint Heat Transfer Conference of ASME-AIChE, Edgewater Beach Hotel, Chicago, Ill. ....Aug. 18-21
- Western Electronics Show and Convention, Pan Pacific Auditorium, Los Angeles, Calif. ....Aug. 19-22
- Society of British Aircraft Construction, flying display and exhibition, Royal Aircraft Establishment, Farnborough, England ....Sept. 1-7
- American Petroleum Institute, Oil Information Committee, meeting, Hotel Statler, Boston, Mass. ....Sept. 3-5
- International Conference on Air Pollution, sponsored by ASME, Hotel Statler, New York, N. Y. ....Sept. 4-5
- International Aviation Show, Coliseum, New York, N. Y. ....Sept. 6-14
- SAE National Farm, Construction, and Industrial Machinery Meeting, Milwaukee Auditorium, Milwaukee, Wis. ....Sept. 8-11
- First International Congress of Aeronautical Sciences, Palace Hotel, Madrid, Spain ....Sept. 8-13
- Second International Congress on Air Pollution, sponsored by ASME, Hotel Statler, New York, N. Y. ....Sept. 9-10
- National Petroleum Association, 56th annual meeting, Hotel Traymore, Atlantic City, N. J. ....Sept. 10-12
- Process Industries Conference, sponsored by ASME, Hotel Statler, Buffalo, N. Y. ....Sept. 15-17
- Instrument-Automation Conference, 13th annual meeting, sponsored by Instrument Society of America, Convention Hall, Philadelphia, Pa. ....Sept. 15-19
- National Industrial Conference Board, annual marketing conference, Waldorf-Astoria Hotel, New York, N. Y. ....Sept. 17-19
- Material Handling Institute, Inc., fall meeting, The Greenbrier, White Sulphur Springs, W. Va. ....Sept. 22-24
- Standards Engineers Society, 7th annual meeting, Benjamin Franklin Hotel, Philadelphia, Pa. ....Sept. 22-24
- Pressed Metal Institute, annual meeting, The Cloisters, Sea Island, Ga. ....Sept. 28-Oct. 2
- SAE National Aeronautic Meeting, Production Forum, and Aircraft Engineering Display, Ambassador Hotel, Los Angeles, Calif. ....Sept. 29-Oct. 3
- ASTE Semi-Annual Meeting and Western Tool Show, Shrine Exposition Hall, Los Angeles, Calif. ....Sept. 29-Oct. 3



**INTRODUCING!**

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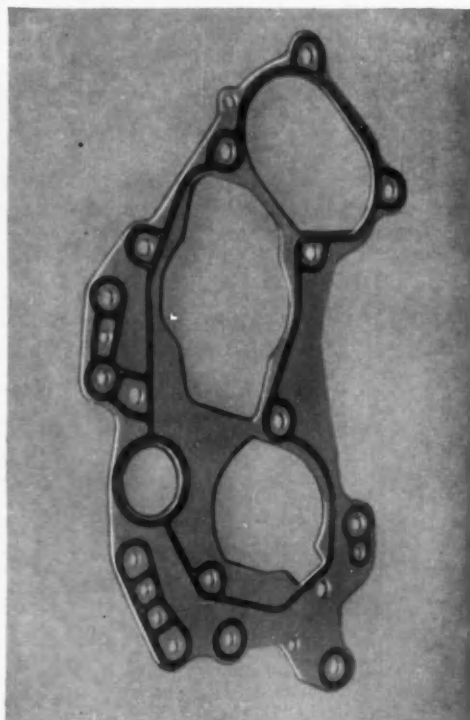
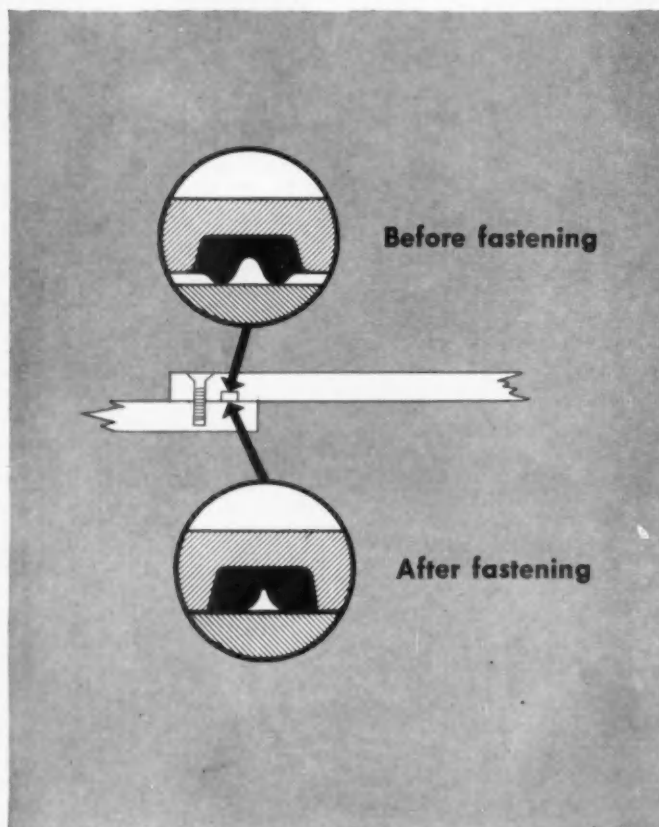
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Another new development using

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Diagrams show functioning of Gask-O-Seal, manufactured by Parker Seal Co., a Division of Parker-Hannifin Corporation, Culver City, Calif. Photo shows flexibility of application to a wide variety of gasketing problems. B.F. Goodrich Chemical Company supplies the Hycar nitrile rubber materials.

### uses glands of Hycar NEW GASKET IDEA PROVIDES SAFE, SURE STATIC SEALING

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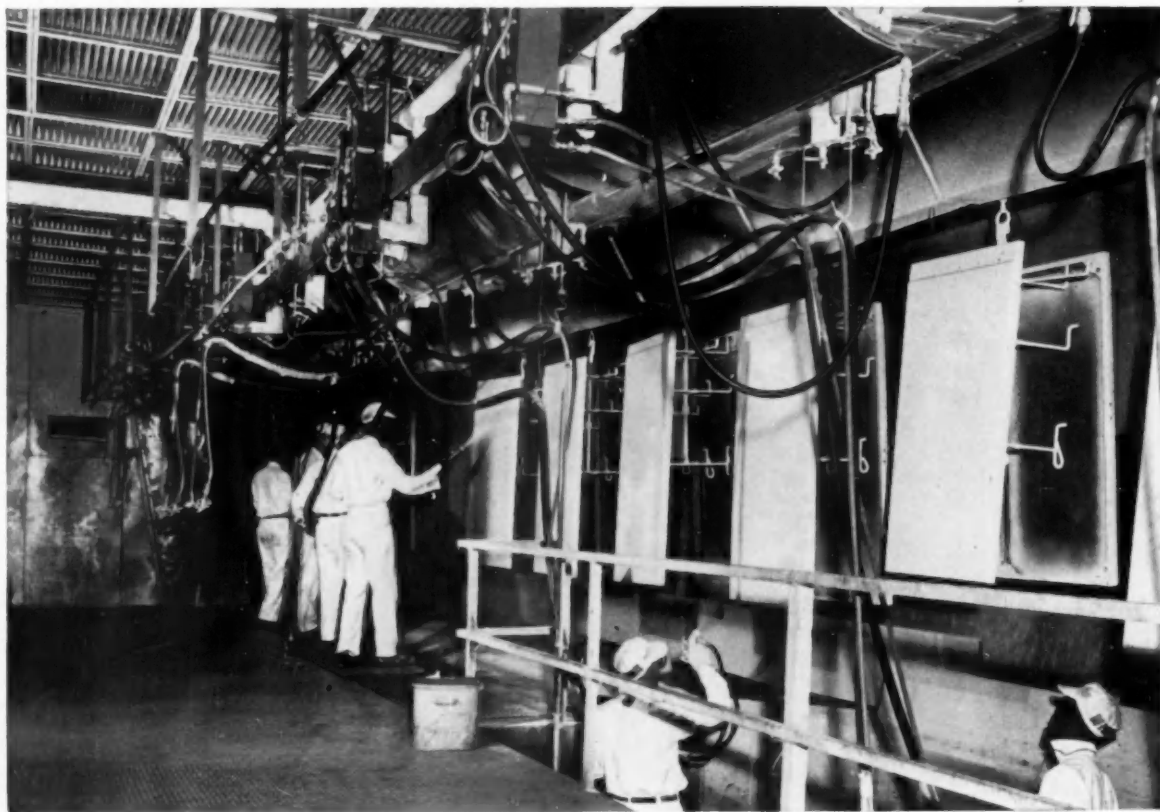


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# \$75,000 SAVED BY DEVILBISS HOT SPRAY



Refrigerator doors are sprayed in DeVilbiss water-wash spray booth—one of eight such booths in this modern plant. A battery of DeVilbiss remote paint heaters serves the line; each station is equipped with two DeVilbiss heat exchangers and spray guns.

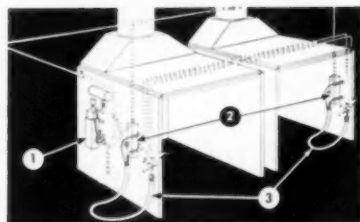
One of the world's largest appliance manufacturers has experienced important material savings as a result of a DeVilbiss hot-spray installation in its Midwest plant.

Although this equipment has been in operation less than two years, the company reports an estimated reduction in primer and enamel consumption of 10% to 15% compared to former cold-spray methods—a saving of about \$75,000 annually! What's more, where spray booths once required

cleaning 13 times a year, this has now been reduced to only 3 times a year—due to the reduction of spray fog.

Perhaps you, too, can profit from DeVilbiss hot spray. This method offers smoother finishes with less shrinkage; heavier film build; faster drying; and lower spraying pressure with minimum overspray!

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DeVilbiss hot-spray system is fool-proof; adapts to multiple gun hook-ups. Hot water from master heater ① heats paint in exchangers ②; heat-jacketed hose assemblies ③ keep paint hot right up to guns, assuring uniform viscosity at all times at each gun.

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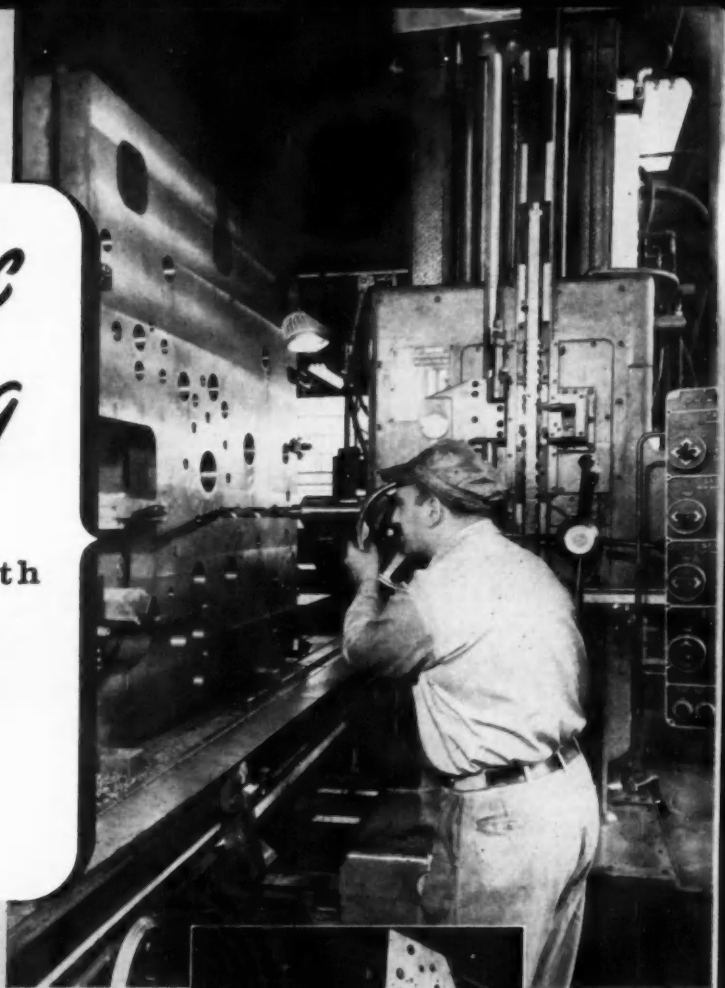
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# Automatic Positioning

Reduces  
Production Costs with



**H.B.M.**  
MODEL 75



The experience of George Hantscho Company, Inc., Mount Vernon, New York, builders of equipment for the printing industry, is typical of that enjoyed by users of Bullard H.B.M., Model 75.

#### THE PROBLEM

To bore 105 holes, from 5" to 1/2" in diameter, in both side frames of paper folding machine to support rollers, gears and folding cylinders. Some holes must be aligned vertically and others horizontally.

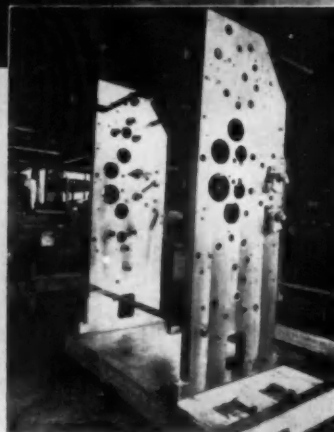
#### THE SOLUTION

Mount pair of side frames, 3/8" apart, on table of 4" Bullard H.B.M., Model 75, equipped with automatic table and head positioning. Bore all holes of the same size beginning with the largest and working down to the smallest.

#### THE ADVANTAGES

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Partially assembled side frames ready for ink rollers, gears and printing cylinders.

How about your boring problems? Are you applying all the advantages of a Bullard H.B.M., Model 75 to them? If not — get the full story from your nearest Bullard Sales Engineer or write

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## High Spots of This Issue

### ▼ Production Lines for Chrysler Power Steering

Chrysler Corp.'s Indianapolis plant, built to turn out automatic transmissions, now also is producing all the firm's power steering units. This article describes in detail the plant's highly automated production lines for steering mechanisms. Page 38.

### ▼ Plastics in the Automotive Field

This is the second section of a two-part article devoted to automotive applications of plastics. Covered in this part are new developments in such thermoplastics as acrylics, cellulose, fluorocarbons, polyethylenes, and vinyls. Page 42.

### ▼ Special Machines at Chance Vought

Economical production in limited quantities has been achieved at Chance Vought by use of special machines requiring only a small capital investment. Some of the techniques for obtaining low-cost production are detailed here. Page 48.

### ▼ Industry Missile and Space Age Conference

A large group of industrialists and civic leaders turned out in Detroit recently to listen to top figures in the missiles field. Among the subjects aired at the conference were the role of subcontractors, missile systems reliability, and inertial guidance systems. Page 51.

### ▼ Fabricating Titanium Cases for Compressors

Temco Aircraft Corp. has developed new techniques to overcome the difficulties of fabricating titanium metal. How Temco engineers are applying these new methods to turn out titanium cases for jet engine compressors is told here. Page 52.

### ▼ 29 New Product Items And Other High Spots, Such As:

Russian trucks at Brussels Exhibition; special tooling for tractor crankshafts; news of machinery industries; metals report; observations; and industry statistics.

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# News

## OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 119, No. 3

August 1, 1958

### Big Three To Drop Low Models To Make Room for Small Cars

The "bulk sales" divisions of the Big Three — Ford, Chevrolet and Plymouth—will remove their lowest price models from dealer showrooms to make room at the bottom of the price scale for the small car. Meanwhile, the basic lines are being upgraded to provide more distinction to the small car.

By 1960, the six-cylinder versions of the Ford Custom 300, Chevrolet Delray and Plymouth Plaza will not be carried as part of the regular line. A low-priced stripped model, however, will be kept for fleet sales.

The trend already has begun. Chevrolet this year introduced the Impala at the top of the line, and Impala sales are outstripping Delray sales by a good margin. In 1959, more models will be offered in the Impala series.

Ford also began upgrading the Fairlane 500, and more is in store. The Thunderbird, currently a "hot" sales model, will become a part of the regular Ford line in 1960. Ford styling will carry Thunderbird ideas.

Plymouth will take the big step in 1959. It will drop the Plaza from the regular line and make the Fury series, with several models, a part of the regular listing.

Removing the lowest priced models will open a price gap at the bottom so that the small cars, when they arrive, will not be so near the rest of the line. This will help set the small car up as a low-priced car. The result of this move will be to create small car sales where they may not exist today.

### Bulk of 1958 Model Production Will Be Finished This Month

By mid-August, all but a few of the U. S. automobile assembly lines will have ended production of 1958



### EDSEL STYLING INFLUENCE SEEN ON FORD E-196X

The E-196X, a  $\frac{3}{8}$  scale model unveiled by Ford Motor Company's Styling Office, illustrates a possible evolution of the 1958 Edsel front-end theme. The E-196X could have a marked influence on the styling of future models, according to George W. Walker (right) vice-president and director of styling. I. B. Kaufman, executive stylist, Edsel Styling Studio, indicates how the front end of the E-196X evolved from the Edsel vertical grille.

model passenger cars, and tooling will be under way for what is hoped will be a more successful year.

Only the M-E-L Div. has scheduled 1958 production into September, and this probably will not be in all plants. Thunderbird will continue to build at M-E-L's Lincoln assembly plant, but Edsel, Mercury and Lincoln lines will stop for changeover "sometime in September."

By Aug. 1, all other divisions except Ford, Chevrolet and Plymouth were ending production. Ford was set to go down "during August," Chevrolet about mid-month, and Plymouth Detroit on Aug. 15, with the Evansville plant closing its line permanently Aug. 14.

Buick was the first to shut down, in late June. Then De Soto ended production July 9, Chrysler and Im-

perial in Detroit on July 23, and Dodge Main July 24. The Chrysler Corp. Los Angeles plant shut down July 29, and the Newark, Del., plant is scheduled to end '58 work on Aug. 5.

Studebaker-Packard ended its model run before the end of July.

Aug. 1 was the date set for shutdown at American Motors, Cadillac, Pontiac and Oldsmobile.

Although American Motors is scheduled to begin '59 production Aug. 25, after a shutdown of only three weeks, the rest of the industry probably will not be ready to build new models until after Labor Day.

General Motors, with the earliest closing and earliest announcement dates of the Big Three, no doubt will schedule its inventory build-up earlier than either Ford or Chrysler.

# News

## AUTOMOTIVE AND AVIATION



Shown in operation is Westinghouse equipment for radio-frequency hardening of automobile parts

### Westinghouse Equipment Used To Harden Automotive Parts

Equipment for radio-frequency hardening of automobile parts has been installed at a midwestern automotive parts manufacturing concern. Built by Westinghouse Electric Corp., this equipment is one of a series of automatic and semi-automatic tools engineered to solve a hardening problem.

For this particular application—induction hardening of the internal spline of a universal joint yoke—Westinghouse has supplied a 50-kw, 450-kc radio-frequency generator, a dual-position worktable, two lift-rotate spindles and special fixtures. The r-f generator and its associated output transformers (located in the worktable) supply the concentrated power necessary for high-speed surface hardening.

The dual-position worktable houses the lift-rotate spindle and special fixtures and incorporates control circuits to integrate this work handling equipment and the r-f generator. The lift-rotate spindle imparts linear as well as rotary motion to the work.

The entire operation is semi-automatic, requiring only manual loading and unloading of the work. The operator loads a part to be hardened into a fixture at one station, and

presses a button that sets the machine in motion and applies r-f power to the inductor. He loads a part into the other fixture, and starts this station with another push button.

In the first station, the work is lifted into a solenoid-type inductor where the internal spline surfaces are heated to hardening temperatures and is then lowered over a quench tube for spray quenching. Uniformity and concentricity of the case depth is assured by position guidance and rotation of the work during this heat-quench. When heating in the first station is finished, power is automatically transferred to the second station.

During the entire process, the operator handles only two controls—the start-stop push button for each work position. All other adjustments including any particular heat cycle are preset.

### Chrysler Corp. Retail Sales Increase In Second Quarter

Chrysler Corp.'s retail sales of passenger cars and trucks increased during the second quarter of 1958, according to group vice-president Byron Nichols. He said passenger car sales improved 5 per cent and truck sales 8.8 per cent during the period.

Chrysler passenger car sales fell

sharply in the first quarter this year after a good year in 1957.

Part of the sales increase might be traced to the jump in station wagon sales, which are running 16.4 per cent ahead of last year. Nichols said that station wagons currently are taking more than 21 per cent of retail passenger car sales in the Plymouth, Dodge, De Soto and Chrysler lines.

The biggest gains have been in the second quarter. In the first three months, station wagons took 18, 20 and 21 per cent of the corporation sales. During the warmer spring months, however, wagon percentages were 22, 24 and 26 per cent of total sales.

Rambler sales continued to set records in July. For the first 10-day period, AMC sold 5111 Ramblers, more than three times the sales during the comparable 1957 period and the highest 10 days in Rambler history.

Since AMC's current fiscal year began last Oct. 1, Rambler sales are up 70.2 per cent over the previous year. Current year sales totaled 117,943 through the first 10 days of July, compared to 69,310 a year ago.

June, with sales of 14,876 cars, was AMC's highest month of 1958.

Chevrolet also recorded its highest 10-day period of the year as June ended, with sales of 47,919 passenger cars and 11,733 trucks. The passenger car sales were 5.4 per cent higher than the previous top 1958 period, while truck sales rose 29.2 per cent.

### Willys To Expand in Brazil; Will Build Passenger Cars

Willys-Overland do Brasil, an affiliate of Willys Motors, Inc., will tool for production of a small Willys passenger car by late 1959 or early 1960 as part of a \$22 million expansion program. Present plans call for a yearly production rate of 20,000 cars by the end of 1961.

Currently, there are no true passenger cars being manufactured in Brazil. Since Willys already has the dies (from the Aero Willys) and an established manufacturing operation in Sao Paulo, it seems unlikely that another manufacturer could jump into the market ahead of Willys. Consequently, Willys-Overland do Brasil should be able to sell its entire output on the home market with little difficulty, leaving no surplus for export to the U. S. or other countries.

The passenger car will be a six-cylinder model resembling the Aero Willys but with modifications made to suit Brazilian market and road conditions.



### POST-TYPE EXTRACTOR

A movable post-type extractor at the Ford Chicago Stamping Plant features electric motion control. Electric clutches and brakes, built by Warner Electric Brake & Clutch Co., are used for the equipment. Requiring only 30 watts of power for energizing their electromagnets, they make it possible to set up the extractor quickly when it is moved to a new work location.

The Brazilian firm will increase its production five times by the end of 1961. Current production of Jeep utility vehicles and station wagons is at the rate of 12,000 units a year. By 1961, production is expected to be at the rate of 40,000 Jeep vehicles in addition to the 20,000 Willys cars.

Station wagon production, incidentally, began just last month (July) in Sao Paulo and is expected to reach the rate of 7500 units a year by next Jan. 1.

The passenger car and Jeep expansion program is backed by \$22 million in new money, including \$3.5 million from three U. S. firms: International Finance Corp., American Overseas Finance Co. and Chase International Investment Corp. Willys Motors, Inc, the Toledo parent firm, is putting up \$6.5 million in tools and dies, new production equipment and machinery. The balance of the money will come from public stock sale in Brazil.

By 1960, the Willys and Jeep vehicles built in Brazil must have at least 95 per cent Brazilian content, by weight. Current Jeeps have approximately 77 per cent, and station wagons have 65 per cent national content.

The Willys-Overland do Brasil engine plant already has a capacity of 60,000 units a year, enough to take care of 1961 requirements. The recently-announced expansion program includes a fully-integrated axle and transmission plant, which will have extra capacity to supply outside automotive firms, and a new passenger car assembly plant of 150,000 sq ft.

The Willys production in Brazil is the second passenger car venture undertaken this year by Latin American affiliates of the parent firm. Industrias

Kaiser, S. A., in Cordoba, Argentine, began building the Kaiser automobile last spring and already is producing at a rate of nearly 3000 cars a year.

### Japanese Automobiles Invade U. S. Market on West Coast

Two Japanese passenger cars made their first U. S. appearance last month (July) in West Coast showrooms. The Datsun 1000, made by Nissan Motor Car, Ltd., of Yokohama, and the Toyopet Crown, made by Toyota Motor Co., Ltd., of Nagoya, were shown in Los Angeles. Both the Nissan and the Toyota firms expect their small passenger cars to be on sale in eastern outlets by the end of the year.

The Datsun 1000 is a four-door

sedan priced for delivery in Los Angeles at \$1845. The Toyopet Crown, also a four-door sedan, is slightly larger and priced for Los Angeles delivery at \$2222. Both cars have wheelbases of less than 100 in.

The Nissan distributor in Los Angeles hopes to receive 750 to 800 cars this year and 200 to 300 a month during 1959. Toyota is more optimistic, hoping for 1959 deliveries of from 6000 to 10,000 cars.

### Sun Oil Co. Discloses Outlays For Switch to Six-Grade System

Sun Oil Co. has disclosed that it spent \$10.3 million with local contractors in converting 8900 Sunoco stations in 21 states and Eastern Canada to use the company's six-grade gasoline marketing system. The changeover to the new marketing system was completed the early part of July ahead of schedule.

The job of building additional underground storage and installing 10,000 of Sun's new Custom Blending pumps was done by local businessmen in the various communities in which the company markets. This was only part of the conversion program. Simultaneously, the company conducted 3000 separate meetings to train 35,000 persons in the operation of the new multi-grade system.

This was preceded by research, dating back to 1953, which resulted in the development of octane concentrate, an extremely high octane fuel, and the blending pump which are the key physical factors in the new system. Then the company market-tested the system in Florida for a year.



### TRAILER TRAINS FEATURE ALUMINUM DUMP BODIES

Shown here is one of a fleet of 12 trailer trains featuring aluminum dump bodies designed and fabricated by Daybrook Hydraulic Div., Young Spring & Wire Corp. They have been put into heavy-duty service hauling aggregate for use in highway construction. The trains were engineered to transport the maximum payload for the operator with an average "bonus payload" of 10,000 lb of aggregate per train provided as compared with previous equipment used.



### AMERICAN BRASS CO. OPENS NEW WEST COAST MILL

This operation—charging a brass furnace prior to casting extrusion billets—was on view when The American Brass Co. formally inaugurated its new \$18 million mill at Paramount, Calif., recently. The mill has a rated capacity of 30 million lb annually of copper and copper alloys in the form of tube, sheet, strip, rod, drawn products and special shapes. The plant has 400,000 sq ft of manufacturing space and is equipped with modern smoke control equipment. The American Brass Co. is a wholly-owned subsidiary of The Anaconda Co.

### Curtice Will Turn 65 Aug. 15, Will Retire as GM President

Harlow H. Curtice, president and chief executive officer of General Motors, will celebrate his 65th birthday on Aug. 15 and probably will relinquish his post shortly afterward under GM's compulsory retirement ruling.

The mandatory retirement age of 65 has been observed rigidly in the past at General Motors, even with vice-presidents and other key executives. So it can be expected that Curtice will retire, although the board of directors could ask him to stay on a while longer.

Former Cadillac general manager Don E. Ahrens was asked to remain in his post after his 65th birthday a few years ago. This, however, was an unusual exception.

Speculation on a probable successor to Curtice is rampant in Detroit. Presumably, the new GM president will be one of the present 33 vice-presidents. Some can be eliminated immediately because of age—either too old or too young. Some names are mentioned more often than others.

The new president (assuming that Curtice does retire and a successor is to be selected immediately) probably will be named at the Sept. 8 meeting of GM's board of directors. GM may take advantage of the New York

Motorama in mid-October to introduce its new boss to the public.

Curtice joined General Motors in 1914 at AC Spark Plug Div. In 1933 he was named president of Buick Motor Div. He was elected acting president of GM on Dec. 1, 1952 and president Feb. 2, 1953, succeeding C. E. Wilson. Curtice is the 11th president of GM.

### Canadian Firm Develops All-Aluminum Car Trailer

Aluminium Ltd., Canadian aluminum producer, announced the development of a new aluminum car transporter-trailer, believed to be the first of its kind in the world.

The new vehicle was designed and built by Aluminium Co. of Canada Ltd., Aluminium's chief subsidiary.

Chief features of the new trailer are its greater inside clearance, resistance to corrosion, and lightness. The vehicle weighs only 7050 lb. and can carry a full load of five cars.

Aluminium Ltd. said it plans to make designs for the new unit available to trailer manufacturers as soon as prototype tests are completed.

### Tractor Firm Bids To Get into Passenger Automobile Business

Massey-Ferguson, Ltd., Canadian tractor manufacturer, is making a

bid to get into the passenger car business through acquisition of stock in Standard Motor Co. of England.

M-F already owns some 5.4 million shares of Standard Motor, but under the offer the firm would pick up an additional 3.6 million shares, giving it a total of approximately 30 percent of Standard stock. M-F has offered to purchase stock from Mulliners Holdings, Ltd., an English automotive body builder which would be issued stock by Standard under a purchase plan.

Standard, in addition to manufacturing tractors for M-F, has a passenger car line. There is some speculation in Detroit that Standard is looking for a sales agreement with an American firm that would give the English company broad coverage in the U. S. as well as in the sterling export market.

### Ingersoll Div. Gets Award For Two Army Amphibians

Ingersoll Kalamazoo Div. of Borg-Warner has been awarded an Army contract for \$380,862 for the development of two new "amphibious lighters" with 5 and 15 ton payload capacities.

The new amphibians, which will replace World War II DUKWs, will stress improved water operation, including greater speed and the ability to negotiate heavy surf.

Features will include lightweight aluminum construction, four-wheel drive, interchangeability of engines and power trains, and large-diameter, low-pressure tires.

The 15-ton model will be powered by two 250-hp engines and will be capable of speeds of 12 mph afloat and 25 mph on land. It will be 45-ft long, 12½ ft wide, and will be equipped with a bow ramp.

The 5-ton version will be 35 ft long and 9-ft wide, with a single engine located aft and forward controls. Maximum speed will be 10 mph afloat and 25 mph on land. It will have removable side gates for cargo.

Delivery of the first 5-ton prototype is slated for June, 1959, and of the 15-ton prototype by August, 1959.

### Borg-Warner Steel Division Elects Ingersoll President

Ingersoll Steel Div. of Borg-Warner Corp. has named Harold G. Ingersoll, Jr., president and general manager of the division, succeeding L. G. Porter who becomes chairman of the supervisory board. Ingersoll formerly was executive vice-president and general manager, and Howard E. Morison succeeds him as vice-president.





Operator at the Chevrolet Flint, Mich., assembly plant, taps a small lead weight to the inside of a wheel. A circular dial (see arrow) on top of the machine operates on a bubble level principle to give the operator the amount of unbalance, if any, and the location where the weight should be applied.

### Balancing of Wheel Assemblies Nears Perfection at Chevrolet

A new peak in production line balancing of wheel assemblies has been reached by Chevrolet with special equipment installed in 12 of the division's assembly and manufacturing plants. The new machines are said to balance wheel-and-tire and hub-and-drum combinations within two in.-oz. of perfect.

Installed at the assembly plants are single-plane, precision balancing machines to which mounted wheels and tires are fed automatically by conveyors. The machine measures any unbalance in inch-ounces by a sensitive wire device and then gives the location of unbalance on a dial.

The operator applies compensating lead weights to the spot indicated on the dial. Weights are always applied to the inside of the wheel where they will not show. The same type of machine and method is used to balance hub and drum assemblies at the manufacturing plants.

While adding one more step to car-building operations, the machine is geared to assembly line operations and can balance a car's five wheels in 55 sec. Since the wheel with tire and brake drum with hub are balanced as units, any combination or rotation of the units still produces the desired balance all the way around.

To round out the process, a smaller balancing machine of the same principle is used at each plant by quality control inspectors to spot check the production operation. Added to this is a unit devised by Chevrolet to run continuous tests of tires supplied to assembly plants.

# A I TABLOID

Wisconsin Motor Corp. has entered an agreement with Ronaldson Bros. & Tippet, Ltd., of Australia, to increase production of its engines.

\* \* \*

Waterbury Farrel Foundry & Machine Co. has been sold to Textron, Inc. The former will operate as a division of the latter.

\* \* \*

Delco-Remy Div. of General Motors Corp. has effected modifications in design to improve its passenger car electric door locking system.

\* \* \*

Mack Trucks, Inc., has started construction of a new \$1 million branch sales-service center in Toronto, Ont., as part of its long-range expansion program in Canada.

\* \* \*

Cleveland Pneumatic Industries, Inc., has acquired Claud S. Gordon Co.

\* \* \*

Transfer of the former Electric Auto-Lite Co. plant at Evendale, O., to General Electric Co. has been completed. Purchase price has been reported at \$15 million.

\* \* \*

Massey-Harris-Ferguson, Inc. is shifting tractor manufacturing from its Racine, Wis., plant to its Detroit facility.

\* \* \*

Kaiser Steel Corp. has completed a new 86-in. hot strip mill at its Fontana, Calif., plant.

\* \* \*

Aluminum Co. of America has developed a new bonding process for joining aluminum and stainless steel.

\* \* \*

Texas-U. S. Chemical Co. has introduced a new type of general purpose, synthetic rubber-carbon black masterbatch. This butadiene-styrene copolymer rubber, reinforced with an ultra-dispersed carbon black, has been designed for use in the tire manufacturing and retread industry.

German automobile manufacturers during the first three months of this year produced 373,000 vehicles, as against 297,000 in the corresponding period of 1957, a gain of 25.5 per cent. The first quarter 1957 gain has been 10.8 per cent over 1956. Exports during the last quarter accounted for 49.6 per cent.

\* \* \*

Metal Atomizing and Processing Corp. has been formed in Hamilton, Ont., to pioneer new processes for the production of metals and alloys in powder form.

\* \* \*

U. S. Crane and Conveyor Co. has been appointed Detroit-area distributor for the line of overhead traveling cranes, jib cranes, hoists and trolleys of Conco Engineering Works.

\* \* \*

Cessna Aircraft Co. is reentering the two-place market with its new Model 150.

\* \* \*

Industrial Rayon Corp. and Spencer Chemical Co. have formed Ohio River Chemical Co. for the manufacture of caprolactam, a basic raw material used in the manufacture of nylon. The new company, it was stated, will construct and operate a 20 million lb caprolactam plant near Ashland, Ky.

\* \* \*

B. F. Goodrich Chemical Co. is expanding its new Henry, Ill., General Chemicals Plant.

\* \* \*

Bell Aircraft Corp. has developed laboratory test equipment to check components of planes and missiles that are sensitive to noise.

\* \* \*

Thompson Products, Inc., has merged its Michigan and Hydraulics Divisions to form the Michigan Group.

\* \* \*

New York Air Brake Co. has changed the name of its manufacturing division in Kalamazoo, Mich., to the Hydreco Div.



# AVIATION MANUFACTURING



## FAIRCHILD DELIVERS FIRST F-27 JETLINER

America's first twin-propeller airliner, the Fairchild F-27, was delivered to West Coast Airlines recently and will be placed in scheduled airline service sometime this summer. A total of 15 airlines have ordered the high-wing, 40 passenger F-27, which is now in volume production at the Fairchild Aircraft Div., Hagerstown, Md.

## Esso Survey Outlines Status Of Plane Orders, Deliveries

As the "jet age" draws nearer, world airlines are ordering more of the big turbine planes and are preparing to take first deliveries late this year, in 1959 and in 1960. At the same time, they have added new long-range piston planes to their fleets, are adding more this year for the interim period before the big jets take over many of the world's major long-range air routes. The airlines have begun to commit themselves too on the short-to-medium haul jet of the future and have ordered more medium- and long-haul turboprops for the years just ahead.

A survey of commercial airline orders for new transports included in the current issue of *Esso Air World*, publication of the Esso international aviation petroleum service group, shows that international and domestic airlines ordered nearly 1500 aircraft for delivery during 1957 through 1963. Some 300 additional aircraft have been ordered since the last survey was made in June, 1957. Financial commitment for all aircraft on order and delivered during 1957 comes to more than \$5.06 billion, the largest share being a total investment of \$2.38 billion in pure jet transports.

Grand total of all types and models ordered by the airlines for delivery in the 1957-1963 period is 1497, the sur-

vey reports. Of these 1031, or almost 69 per cent, are U. S.-built transports; 386 are British (principally Viscounts, Britannias, Comets and Vanguards); 33 are Dutch (Fokker-built F-27s), and 25 are French (Caravelles). All of the 397 long-range and most of the 106 medium-haul piston planes are American-built.

In the pure jet field as well, U. S. manufacturers have the edge with a total of 368 orders (DC-8, 707, 720, and Convair 880). Of the other jet contenders, 31 Comets, 25 Caravelles, 24 D.H. 121s, and 35 VC-10s have been ordered. In the turboprop category, British aircraft lead the field with a total backlog of 296 orders remaining to be delivered (209 Viscounts, 47 Britannias, and 40 Vanguards).

## Republic Aviation Will Build Plastic Antenna for Missiles

A contract to produce a large, all-plastic antenna, capable of withstanding pressure blasts of intensities as high as 150,000 lb for use in a secret new guided missiles system, has been announced by Republic Aviation Corp. The order from Raytheon Mfg. Co. calls for prototype production and static testing of the Republic design.

Shaped like a high (eight-ft diameter) elongated dish, the antenna

will be constructed entirely of plastic and will feature specially designed plastic radial strengthening ribs. It will be sprayed with metal coating to reflect radar waves.

The antenna requires construction accuracy to five-one-thousandths of an inch. It will be made from Trulite, a plastic developed and compounded at Republic. The company's Plastic Dept. is also producing parts for Republic's F-105B Thunderchief fighter-bomber and plastic forming dies.

## Goodyear Awarded Contract For Anti-Submarine Missile

The Navy has announced that Goodyear Aircraft Corp. has been awarded a contract by the Bureau of Ordnance, in the approximate amount of \$65 million, for research and development work in connection with Subroc, a new anti-submarine missile system. The contract covers the complete weapon system, including production and tooling methods.

The new weapon is an underwater guided missile which may be fired from above or below the surface. The Subroc system can detect a submarine at long range, compute its course and speed, and fire the missile. The missile is propelled through the air by a powerful rocket; the spent rocket drops away and the warhead continues on to the target. The weapon can destroy enemy targets in an area of many square miles around the launching submarine.

Subroc is now under development at the Naval Ordnance Laboratory. Under the terms of the contract, Goodyear Aircraft will be the prime weapons system contractor and will work with Navy scientists at the Naval Ordnance Laboratory. Principal subcontractors who will be working with Goodyear Aircraft are Librascope and the Kearfott Co.

## B-70 and F-108 to be Powered By the General Electric J93

The Air Force has announced that the General Electric J93 jet engine has been selected to power the North American B-70 advanced bomber and the North American F-108 advanced long-range interceptor.

The B-70 will be capable of speeds in excess of 2000 mph for long distances without refueling at altitudes

above 70,000 ft. The plane was recently named the Valkyrie.

The long-range F-108 will be capable of destroying air breathing attack systems at extreme ranges, and will operate beyond range of ground environment control system. With speeds in excess of Mach 3 and a ceiling of over 60,000 ft, the F-108 will be developed by the Air Defense Command.

### **Janitrol Aircraft Div. Moves Into New Plant in Columbus**

Janitrol Aircraft Div. of Surface Combustion Corp. has completed its move into a new \$2.5 million plant in Columbus, O., and already work has begun on a 10,000 sq ft expansion at the plant.

Much of the 130,000 sq ft at the new plant is devoted to engineering and testing, with approximately 50 per cent of the total capital investment for test and experimental equipment.

A key part of the new Janitrol set-up is a high-altitude testing chamber which has simulated flight conditions at altitudes of some 22.7 miles. The chamber is used for recording operational information on heat exchangers, pneumatic controls and other components used in civilian and military aircraft and in missiles.

The high-altitude chamber, measuring 20 ft in length and 6 ft in diameter, is considered vital to Janitrol's testing program, since the bulk of Janitrol's products involve heat exchange. The chamber is used, for example, to test high output combustion heaters at extreme low temperatures and high altitude atmospheric conditions.

A vacuum system consisting of three pumps is used to create high-altitude conditions. For sea level testing, air is drawn from outside the plant building for testing combustion heaters or heat exchangers in which heat output is high.

### **General Electric Wins Funds For Production of T58 Engine**

The Air Force's Air Material Command has approved full release of \$3.8 million for production facilities for General Electric T58 turboshaft engines. The company expects to be in full production on the engines next year.

The T58, designed for helicopters, delivers 1050 eshp and weighs only 271 lb. It is presently being flight-tested as a twin-engine installation on the Sikorsky HSS-1 helicopter at the GE Flight Test Center in Schenectady, N. Y. This was preceded by



### **BOEING 707s FLY IN FORMATION**

Shown together are two of Boeing's 707 Stratoliners, now undergoing Civil Aeronautics Administration certification test flight. A third production model is also in flight status. Together with the prototype plane, the 707s now have a total of more than 1150 hours of testing.

more than one year of similar testing at the Sikorsky plant in Bridgeport, Conn.

Another twin-engine installation recently completed a flight test program on the Vertol H-21D. Applications which have been announced include the Kaman HU2K-1 utility helicopter, and Sikorsky's S-61 and S-62.

### **Ramo-Wooldridge Corp. Division Redesignates Laboratory Setup**

Space Technology Laboratories, a division of Ramo-Wooldridge Corp., has redesignated its Aeronautics Laboratory as the Astrovehicles Laboratory.

Work of the Astrovehicles Laboratory on propulsion, structures and re-entry problems is generally concerned with the flight of vehicles in space, rather than that of conventional air vehicles confined to the earth's atmosphere. Therefore, it was felt that the name "astrovehicles" more appropriately reflects the laboratory's scope of activities.

The principal line units of the Astrovehicles Laboratory will be the Astrosciences Laboratory, the Vehicle Engineering Laboratory, and Project Management.

Within the Astrosciences Laboratory four departments have been established. They are Engineering Mechanics, Aerophysics Dept., Applied Aerodynamics Dept., and Systems Evaluation Dept. The Vehicle Engineering Laboratory will include four departments: Design, Minute-

man Engines, Special Projects, and Ground Support System. Project Management will include the Propulsion Dept. and the Re-entry Vehicles Dept.

### **Lockheed Backlog for Electras Builds Up as New Orders Spurt**

Lockheed Aircraft Corporation has announced the addition of three new airlines to the list of prop-jet Electra transport customers and confirmation of an order by yet a fourth Australasian airline choosing the jet-age airplane. The purchase covers 11 Electras valued at \$27 million. The new purchases raise the Electra backlog to 151 airplanes worth almost \$325 million on order for a total of 14 airlines serving five continents.

### **Solar Income in Fiscal Year Up Despite Decline in Sales**

Net income of Solar Aircraft Co. for the fiscal year ended April 30, 1958, increased substantially over earnings in the preceding year, although sales for the latest period were slightly lower.

For the latest fiscal year, Solar's net sales were \$78,706,060. Profit before Federal income tax and refunds was \$3,151,466, and net income was \$1,555,466. Comparative results in the fiscal year ended April 30, 1957, were sales of \$83,118,545; profit before taxes of \$949,981; and net income of \$384,981.

While sales in the latest fiscal year (Turn to page 33, please)

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Oakite Products, Inc.—J. Justin Basch has been appointed marketing vice-president, and William A. Baltzell has become industrial sales manager.



Esso Standard Oil Co.—Stanley C. Hope has retired as president, and William Naden has been elected to succeed him.



Consolidated Electrodynamics Corp.—Frank M. Jenner and Kennett W. Patrick were appointed vice-presidents.

Chrysler Corp.—C. C. Firth was named general plants manager, and George H. Stover was made director of production control for the car and truck assembly group.

AC Spark Plug Div., General Motors Corp.—Edward J. Brandl and Everett D. Garland were made product merchandising managers.

Oakite Products, Inc.—Dr. Clarence Bremer has been appointed technical director.

Tung-Sol Electric, Inc.—Dr. Alfred K. Wright, vice-president in charge of engineering, has also become vice-president in charge of operations and engineering. Paul Scharninghausen has been named vice-president and general manager of the Radio and Television Tube Div.

Sheffield Corp.—Jack T. Welch was appointed vice-president in charge of field sales, and William I. Wilt was named vice-president of the Gage and Instruments Div.

Thompson Products, Inc.—George W. Stewart is now manager of the West Coast Works.

Glidden Co.—R. V. Hudson was appointed technical manager of automotive finishes and Paul Colbrooke was named special automotive representative and color coordinator.

Purolator Products Inc.—Lee Sander has become Eastern Zone manager.

Hartford Machine Screw Co. — James J. Ford was named general manager of the company and Fritz Maier was made sales manager of the Fuel Injection Div.

D. W. Onan & Sons Inc.—Roy E. Mullin has been appointed general sales manager.

Borg-Warner Corp., Ingersoll Steel Div.—Harold G. Ingersoll, Jr., was elected general manager succeeding L. G. Porter, now chairman of the division's supervisory board.

Pennsalt Chemicals Corp. — Robert R. Pierce has been named manager; James H. Cogshall, sales manager; and Robert S. Mercer, manager of development in the Corrosion Engineering Products Dept.

Dodge Div., Chrysler Corp.—William C. Cawthon has been named plant manager at the Detroit assembly plant.

Convair Div., General Dynamics Corp.—J. R. Dempsey was appointed vice-president.

Crucible Steel Co. of America, Technology Dept.—Dr. M. J. Day was named vice-president-technology; W. E. Gregg, director of technical development; and Dr. W. L. Finlay, director of research.

Bendix Aviation Corp.—John M. S. Hutchinson is now staff assistant to the president on manufacturing activities.

Allis-Chalmers Mfg. Co., Industries Divs.—Charles W. Parker was named director of sales promotion.

Jones & Laughlin Steel Corp.—Paul L. Tietjen has been promoted to general manager of traffic and transportation, and Dr. Carl M. Marberg has been made manager, technical services for the Container Div.

Eaton Mfg. Co.—Richard A. Jaksic is now office manager and controller of the new Brazilian subsidiary.

Dynatron Corp.—Robert H. Chirgwin has been made vice-president in charge of sales.

Lockheed Aircraft Corp., Georgia Div.—James P. Lydon was named assistant manufacturing manager; Fred N. Dickerman, assistant chief engineer; F. A. Cleveland, chief advanced design engineer; and E. B. Gibson, preliminary design division engineer.

Electric Furnace Co. — John W. Holzwarth is now manager of the new Western district office in Santa Ana, Calif.

Hevi-Duty Electric Co.—Richard Hayden is now head of gas furnace sales.

Minneapolis - Honeywell Regulator Co., Boston Div.—C. B. Harrison has been named marketing manager; J. A. Vitka, contract administration manager; and W. A. Rote, director of engineering.

Kelsey-Hayes Co.—Charles W. Sinclair has been appointed vice-president of engineering for all divisions.

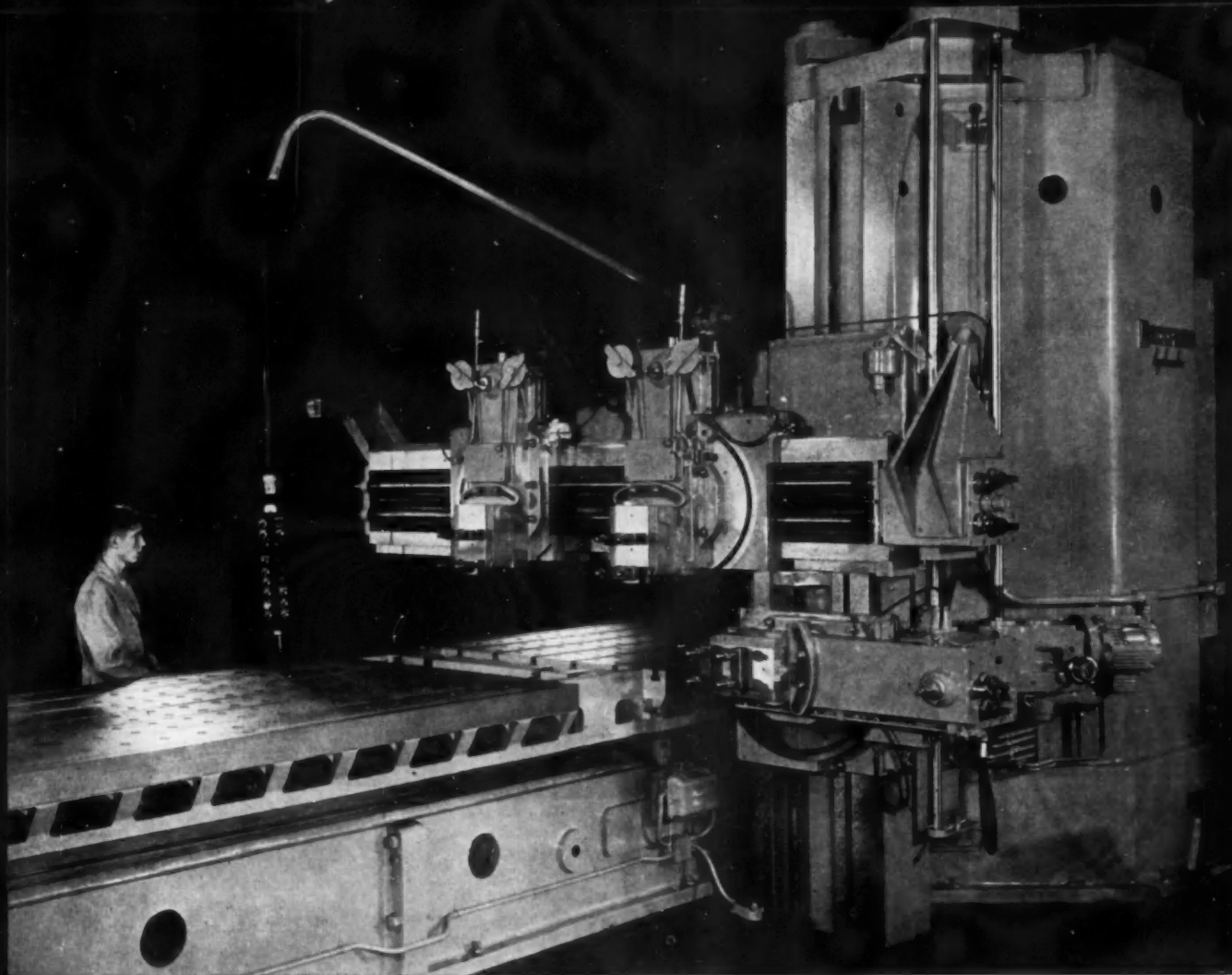
(Turn to page 32, please)



General Electric Co.—W. T. Harmon was made manager of marketing for the Production Engine Dept.

Clark Equipment Co., Industrial Truck Div.—B. E. Phillips was appointed general sales manager, succeeding L. A. DePolis, who resigned.





## HOW TO PROTECT A HYDRAULIC SYSTEM FROM RUST, SLUDGE AND FOAM

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# MIEN

## IN THE NEWS



*Caterpillar Tractor Co.—Gail E. Spain was promoted to president of the Foreign Trade Group.*



*U.S. Rubber Co.—John A. Ball has been named sales manager of the new Gillette Tire Div., and L. B. Lillie is now sales manager of the Fisk Tire Div.*



*Dodge Div., Chrysler Corp.—Frank Wylie was promoted to director of public relations, Dodge cars and trucks.*

Continued from Page 30

Data Tape Div., Consolidated Electrodynamics Corp.—**Harold S. Davis** has become sales manager.

Studebaker-Packard Corp. — **Bert Simons** has been chosen to head the company's sales training program.

Minnesota Rubber Co.—**Richard K. Mattocks** has been named sales manager.

Standard Oil Co. (Indiana)—**Wayne A. Proell** was named division director in the Research Dept. in charge of work on solid propellants used in missiles and jet aircraft.

Bohn Aluminum & Brass Corp. — **Paul C. Bailey** has been named manager of sales and manufacturing.

Temco Aircraft Corp. — **Thomas Courtney, Jr.**, has been named chief project engineer.

Clark Bros. Co.—**R. C. McDonald** is now New York district manager, succeeding **Robert J. Spears**, now assistant general sales manager.

Aluminum Industries, Inc.—**William Clausen** has been named president succeeding **Harrison O. Ash**, chairman of the board.

Simplex Machine Tool Corp.—**W. Drury Clark** was elected president.

Consolidated Electrodynamics Corp.—**T. Phillips Morgan** was made controller.



*Electric Auto-Life Co.—Robert H. Boyer has been named controller.*

*Thompson Products, Inc.—J. B. Gates has been named general sales manager of the Michigan Group.*



Square D Co.—**Mitchell P. Kartalia** has been made general manager of the Marketing Div. and **Robert E. King** has become distribution equipment sales manager.

Birma Mfg. Co., Inc.—**George P. Manning** was elected chairman, and **A. Raymond Carlson** was chosen president.

AC Spark Plug Div., General Motors Corp.—**L. B. Smith** has been appointed executive engineer.

Armstrong Cork Co. — **Albert G. Matamoros** has been promoted to general manager of the new Office of Economic and Marketing Research.

Allison Div., General Motors Corp.—**Ronald M. Hazen** has retired as technical assistant to the general manager.

Chevrolet Motor Div., General Motors Corp.—**William J. Massely, Jr.**, is now operations manager of the Detroit Forge plant.

Studebaker-Packard Corp. — **Paul O'Shea** has been named sports car director.

Twin Coach Co.—**Emile L. Dumas** was elected comptroller.

General Electric Co., Aircraft Gas Turbine Div.—**Adrian Paul Fioretti** has been appointed manager, CJ-805 Application Engineering.

Lockheed Aircraft Corp.—**Guy H. Evans** was made director of sales in Europe, Africa and the Middle East, and **James E. Boyce** was appointed director of airline and military sales in Australasia and the Far East.

Norton Co.—**Robert W. Bennett** has been appointed a field engineer at the St. Louis office.

### Necrology

**Edward R. Mason**, 47, chief engineer of mechanical research for the Engineering Div. of Chrysler Corp., was killed in an automobile accident May 12, near Syracuse, N. Y.

**Maximilian E. Pesnel**, 76, retired comptroller, secretary, and board member of Behr-Manning Corp., died July 7, at Albany, N. Y.

**William V. O'Brien**, general manager of the Apparatus Sales Div., General Electric Co., died June 21, at New York, N. Y.

**Bernard J. Povolny**, 52, safety director for three plants of Harrison Radiator Div., General Motors Corp., died June 25, at Lockport, N. Y.

**John J. Delaney**, 62, general manager of Reliance Regulator Div., American Meter Co., died June 10, at Alhambra, Calif.

**Herman A. DePova**, 52, works manager of Midvale-Heppenstall Co., died June 27, at Philadelphia, Pa.

**Robert McC. Johnstone**, 66, head of Johnstone Engineering and Machine Co., died June 22, at Christiana, Pa.





### LIQUID-COOLED BRAKE SYSTEM

New liquid-cooled brake system developed by B. F. Goodrich Aviation Products has successfully completed its first taxi and flight tests on the Boeing 707 jet transport. Rear view of the brake system shows the heat exchanger as installed on the 707 prototype. The system uses circulating fluid to absorb heat from friction surfaces and reduce temperature build-up by as much as 1500 F.

Continued from Page 29

were off about five per cent from the preceding year's amount, they were considerably higher than in any other year in Solar's history. The company's net worth as of April 30, 1958, was \$15,773,980. The backlog of orders as of April 30 was \$45,531,000, compared with \$91,435,600 a year earlier.

### Ramo-Wooldridge Corp. Merges With Thompson Products, Inc.

Thompson Products, Inc., and its affiliate, Ramo-Wooldridge Corp., have announced the signing of an agreement providing for the merger of the two companies. Prior to the agreement, Thompson Products owned approximately 57.5 per cent of the common stock of Ramo-Wooldridge. Payment for the minority interest in Ramo-Wooldridge will be by 271,455 shares of common stock of the reorganized company.

The new company will have a total employment of approximately 20,000 persons. Combined assets will be in the range of \$200 million. Sales for 1958 are estimated in excess of \$300 million.

Plans provide for the resulting company to be named the Thompson Ramo-Wooldridge Corp. and the designation of J. D. Wright, now president of Thompson Products, as board chairman and chief executive

officer; Dr. Dean E. Wooldridge as president; and Dr. Simon Ramo as executive vice-president. Frederick C. Crawford, present board chairman of Thompson Products, will head the Executive Committee and serve the company as a special consultant.

Purpose of the reorganization is to integrate the capabilities of the two organizations with the objective of expanding markets and better serving customers in the automotive, missile, aircraft, electronics, nuclear, and general industrial fields.

### Orenda Tooling for Production Of PS13 Iroquois Jet Engines

Orenda Engines, Ltd., has begun

tooling for production of the powerful PS13 Iroquois jet engine, and production is scheduled to begin later this year at the Orenda plant outside Toronto, Ont.

The Iroquois, with a thrust of more than 20,000 lb, is said to be the most powerful jet engine in the western world. It will be used to propel the supersonic CF-105 Avro Arrow, a 1500 mph fighter plane.

Orenda has been testing pre-production Iroquois models, and the program is "on schedule," according to the company. Meanwhile, a few early CF-105 Arrows have been flying with P&W J-75 power.

Part of the Iroquois development program included flights with U. S. B-47 bombers carrying the Iroquois for testing and observation operations.

### AFS Plans Four-Day Meeting Next September in Detroit

The American Rocket Society is planning a four-day meeting in Detroit next September with technical sessions and public displays featured.

Technical sessions will cover missile production problems, controls for supersonic air breathing engines, monopropellants, auxiliary power supplies, operational and service problems, and reliability in long-range missile components.

Among the participants will be Gen. John B. Medaris of the Army Ordnance Missile Command in Alabama, John Black of Hughes Aircraft, Lovell Lawrence and C. W. Williams of Chrysler Missiles, Brooks T. Morris of Marquardt Aircraft Co., Dr. C. W. Tait of Wyandotte Chemical, Lawrence S. Brown of Ford Instrument Co., and Arthur B. Ash of Sundstrand Turbo Div.



### RAF INTERCEPTOR SHOWN WITH FIRESTREAK

British-built Electric P. 1, an RAF supersonic interceptor is shown with one of its Firestreak infra-red homing guided weapons which are carried on horizontal pylons attached to the fuselage. P. 1 is powered by two Rolls-Royce Avon turbo jets.

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## Meet the new army Mule!

Foot soldier's new friend is light, strong, maneuverable because many parts are made of **MAGNESIUM**

The U. S. Army has a new mule . . . minus the stubborn disposition! Developed by Willys Motors Inc., and Army Ordnance, it's the first mule in history—and the first Army vehicle—to carry a load heavier than its *own weight*. A major reason: Magnesium is used for the platform and wheel castings.

Because of its light weight and simplicity of design, the Mechanical Mule can be turned on its side or even upside down for maintenance or transportation purposes. It can be carried by helicopter . . . or dropped by parachute. Because of its strength, this vehicle can carry 1,000 pounds of equipment—yet it weighs only 900 pounds!

After successfully completing high-priority tests, the Mule has been placed in production and initial deliveries are being made to the famous 101st "Screaming Eagles" Airborne Division. This is another successful application of magnesium, lightest of all structural metals. If your product can benefit from this excellent combination of lightness and strength, be sure to contact your nearest Dow sales office or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 1411E-2.



**DRIVER'S SEAT** and controls are located in the front, engine is underneath in the rear. Lightness, strength and simplicity of design—benefits of magnesium—were utilized fully in this new army vehicle.



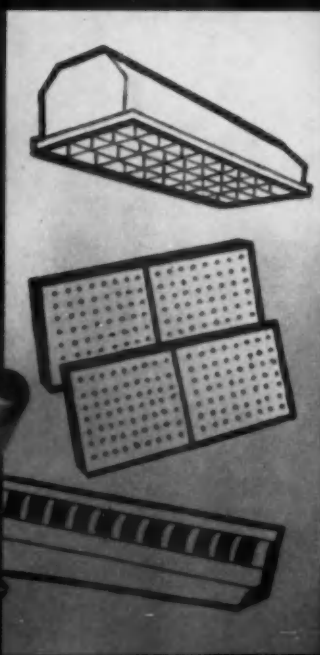
**WALKING, RIDING OR CRAWLING**, the soldier can steer and control the speed to as low as 1 mph in forward or reverse—or cruise along at the rate of 25 mph!



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## HOW ZINC-COATED STEEL SHEETS KEEP PRODUCTS—AND MANUFACTURERS—LOOKING YOUNG

Today, it's almost axiomatic that the more zinc-coated steel you put to work for you, the more freedom your products will have from corrosion—and the more freedom you'll have from customer kicks about corrosion and corrosion-caused maintenance costs.

That's why it pays to use zinc-coated steel sheets in the products you manufacture (such as light troffers, metal ceiling tiles, baseboard heating panels, sliding door hardware, etc.).

Look at the formability, for example. With either electrolytically zinc-coated steel sheets, or continuous process zinc-coated sheets, the tight coating stays tight through the severest fabrication operations. How about corrosion prevention? It's long-lived, uniform, relentless. First cost is low. Maintenance costs are nil. And the results are a lasting credit to your product and your reputation. How about paintability? Electrolytic zinc-coated steel surfaces, chemically treated, are unexcelled for painted products. It lets paint dig in and hold its unbroken smoothness and beauty for keeps.

In electrolytically zinc-coated steel, the name that stands for bonus performance is Weirzin. In continuous process zinc-coated sheets, it's Weirkote. Let us show you how Weirzin or Weirkote will keep your products—and you—looking young.

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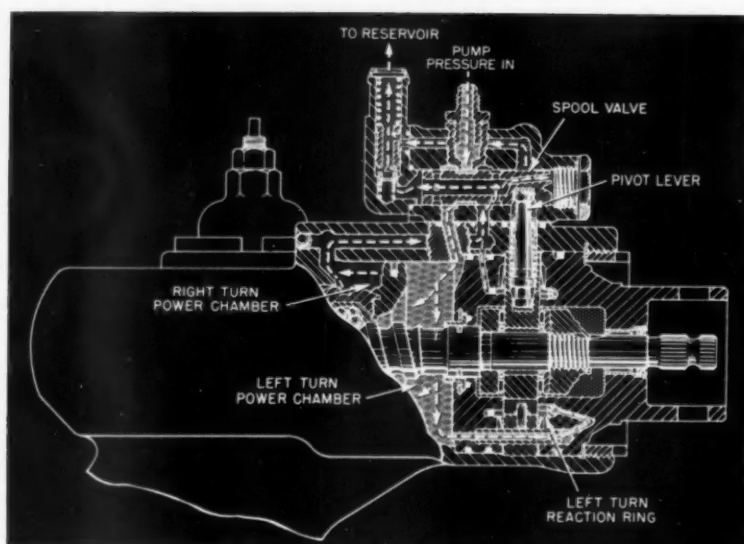
WEIRTON, WEST VIRGINIA

a division of

**NATIONAL STEEL CORPORATION**



# Automated PRODUCTION LINES for Chrysler Power Steering



Part cutaway view of the assembly

**A**BOUT six years ago Chrysler Corp. built a plant at Indianapolis to produce its automatic transmissions. Today that plant is not only producing automatic transmissions, but by use of modern machinery, production facilities for all the company's power steering units are housed there also. The "Constant-Control" power steering unit is used for the

## By Kenneth Rose

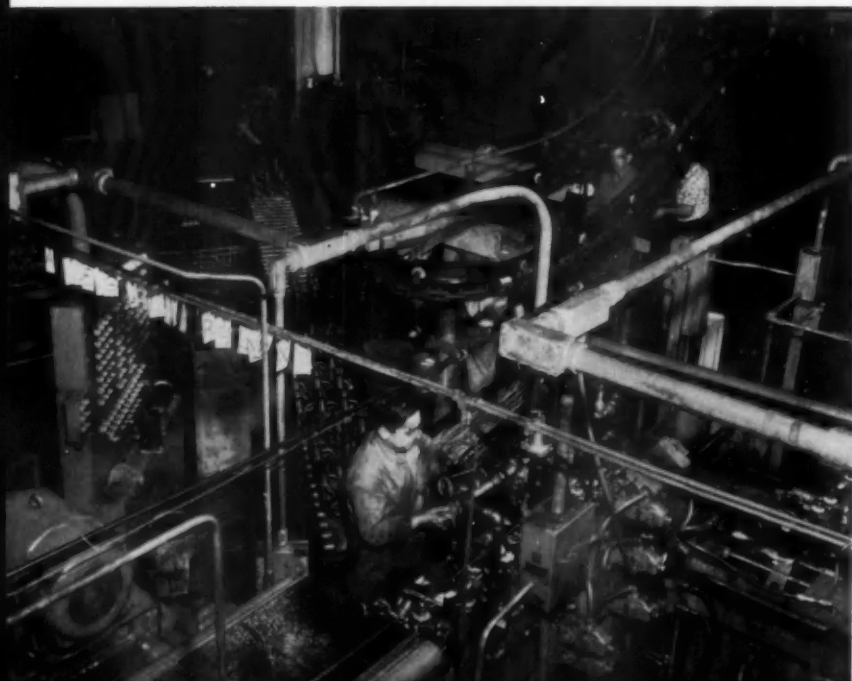
first time on the 1958 Chrysler cars. It is standard equipment on all Imperials, and on the Chrysler New Yorker, Saratoga, and 300-D models, and optional on all other cars of the Chrysler Corp. line.

Fabrication of the parts for the

steering mechanism is highly automated. The housing casting for the unit is of malleable iron. The cleaned castings start through the production line at the Indianapolis plant with a qualifying operation on an Ex-Cello-O machine to insure proper location on the next operation and to prevent waste of processing time on castings that do not have sufficient metal for machining. The pieces then go to a Buhr six-station indexing machine, on which drilling, reaming, and spotfacing operations are performed to establish the position of the unit in the car, and to provide construction points for locating the piece on the transfer machine pallet fixture.

The Cross Transfer-matic that takes up the machining is a 55-station unit built into a rectangle so that the same station serves for loading and unloading. The housings are transferred on pallets 24 in. square. A few idle stations have been provided to give the machine more flexibility, if a change of operations should later be desired. For the first 19 stations the pallets are transferred by a powered transfer bar. The first station is the loading-unloading station, as is station No. 2. No. 3 is an idle station, while at

Housings feed into the loading station on the transfer machine

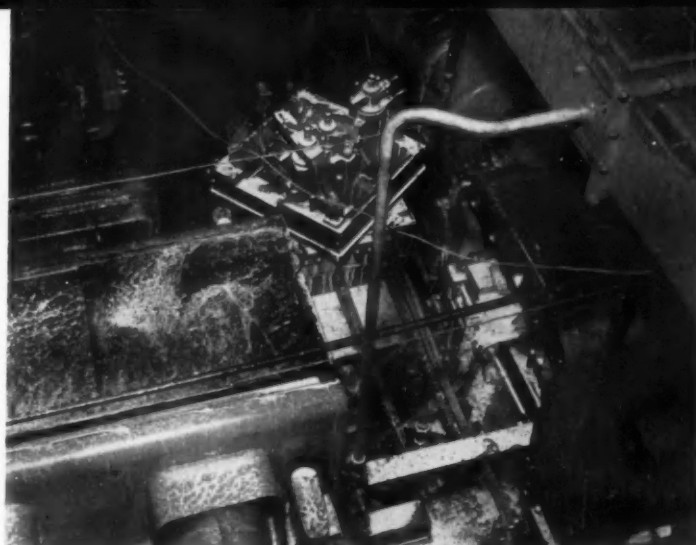


No. 4 the valve body mounting face is rough milled. At No. 5 a slot is milled through the valve body mounting face; succeeding stations finish mill the face and slot with a combination cutter, the valve body face is chamfered, and tools operating simultaneously from both sides of the piece drill two holes, rough bore the large thread diameter, and form three spherical radii over the mounting holes. The large thread diameter is then finish bored, and the spherical radii are finished, two holes are trepanned for O-ring seals, and two diameters are rough bored for the sector shaft with a stepped tool. Threads are tapped in the large thread diameter, and in the crossbore cover diameter.

At station No. 20 there is a turnaround that turns the pallet 90 deg. An oil hole is drilled, and a counterbore is reamed, then the end plugged to provide an internal oil passage. From station No. 20 to No. 33 the pallets are moved by their continuity. The first side of the machine ends at station No. 33, and here the pallets are again indexed 90 deg, then go down a line conveyor to the third side of the rectangle.

To obtain the difference in speed of operation required for finish boring while keeping the time at each station the same, there is an accumulating station, from which four pallets at a time are moved by a 96-in. transfer bar, and finish boring is done simultaneously at four identical stations, providing four times the single station time for the operation. This finish boring is done at stations Nos. 38-41 with piloted boring bars, each with two tools.

The next four stations are turnaround stations, taking pallets Nos. 1 and 3, then Nos. 2 and 4, out of line, turning them 90 deg. and returning them to the line. The pallets are then conveyed four at a time to stations Nos. 46-49, where four diameters in the main body are bored out with boring bars each mounting four single-point tool bits. At station No. 51 an automatic air gage inspects the bores; at No. 52 the pallet is

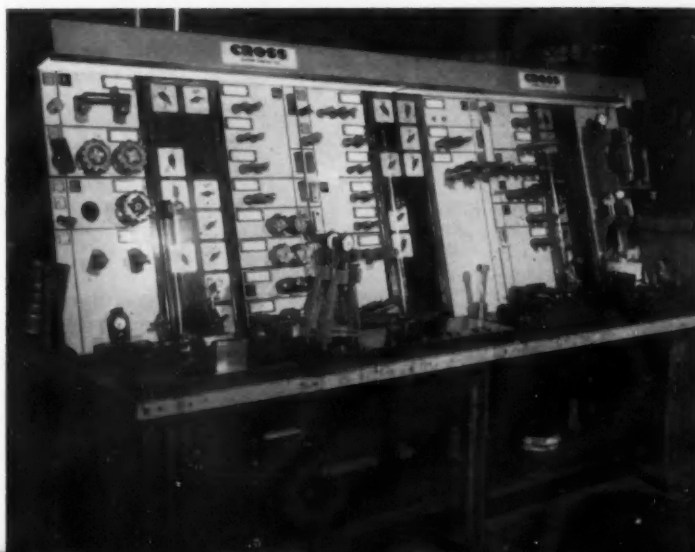


*A turnaround station indexes the pallet 90 deg in the transfer machine*



*Sequence of operations in the Cross machine is completely automatic*

*Spare cutting tools are held in readiness on a machine tool control board*





*The final assembly line for the steering units*

turned 90 deg. to get the sector shaft bore in position for the air gage, and after an idle No. 53, the gaging is done at No. 54. No. 55, the last station, is idle and the work is manually unloaded at the end of the line.

The housings next go to a Micro-matic single spindle hone by an

overhead conveyor, where the cylinder bore is honed to a 25-microinch finish to insure good life for the piston ring. A wash follows, and the housings then go to final assembly on an overhead conveyor.

On the final assembly line, a four-station assembly machine

presses in two bearings, a ball seal, a shaft seal, and a snap ring and washer, then it is date stamped. The final line is a moving belt on which are mounted 50 fixtures over its whole length, over and under. Subassemblies of worm and piston are fed in at right angles to the final line, and are installed, with a spanner and washer. A valve lever is pressed in at the top of the housing, and alined with a gage. The spanner nut is tightened to 160 lb ft with a pneumatic wrench. The sector shaft assembly comes to the final line, and is installed, and the valve body assembly is installed in the unit. This completes the assembly.

The steering unit is then placed on a fixture, lowered into a tank of water as 200 lb of air pressure is applied to the unit, and it is checked visually for leaks. The unit is removed from the water, put on an overhead conveyor and carried to the final testing area, for final test and adjustment according to specifications. A final hydraulic pressure test at 1200 psi, external, checks for leaks. The units then go on a conveyor belt to a fixture where they are alined and pinned so that the steering wheel, when installed in the car, will be in proper driving position.

### **Old Oil Ups Engine Wear, Gulf Research Report Says**

Wear and tear in automotive engines increases three to six times with oil that has been in the crankcase up to 2500 miles and more, according to a research report made public by American Petroleum Institute.

The report noted that a substantial part of this wear in passenger car engines takes place during short stop-and-go trips, particularly during low-temperature operation when there is greater condensation of corrosive vapors on the cylinder wall.

The report, prepared by D. W. Gow, of Gulf Research and Development Corp. presented figures to show that engine wear after 500 miles was almost twice that of new oil; after 1000 miles, about three times as great; and after 2500 miles, more than six times.

Gow said that longer intervals between oil changes also affected engine deposits, and he cited tests showing that oil control rings in engines operated on 2500-mile intervals were about 30 per cent clogged, while those in 1000-mile drain engines had less than 10 per cent clogging.

### **Chicago to Stage Aircraft And Small Car Exhibition**

An exhibition of small passenger and commercial cars and business and private aircraft will be held in Chicago's International Amphitheatre from Oct. 24 to Nov. 2.

The display, described as the first of its kind, is sponsored by International Sports Car and Light Plane Exhibitions, Inc. It will be an annual affair, according to Robert H. Burns, general manager.

Burns said that invitations have been sent to over 4000 manufacturers in the aircraft field, as well as to manufacturers in the small car field in the U. S. and Europe.

### **Foreign Cars Are Subject To Excise Tax, IRS Rules**

Foreign cars, even if they are used, are subject to the manufacturers excise tax when they are initially sold in the U.S.

The tax, as Internal Revenue Service points out, is levied on sales by the manufacturer, producer, or importer of automobiles. It is unimportant, from a tax standpoint, that the cars were used prior to importation.

IRS takes this position in new Revenue Ruling 58-297.

# Newest Russian Trucks

## Shown at Brussels Exhibition

**O**NE of the late arrivals in the vehicle section of the Russian exhibition at the Brussels World Fair is the ZIL-157, a six-by-six with 4½-ton payload rating. Single wheels with 12.00 x 18 tires are used all around, with provision for tire deflation and inflation while in motion to improve traction on soft ground. Engine is the basic 338-cu in. L-head gasoline unit from the ZIL factory in Moscow, developing 104 hp at 2600 rpm.

Transmission includes a five-speed gearbox in which the top ratio is an overdrive (0.81 to 1), and a two-speed transfer case incorporating the front-axle engagement. This model weighs 12,000 lb and has a mean wheelbase of 167 in. A forward winch is standard equipment.

A departure from prewar styling is the cab design of the GAZ-52, which features hooded headlamps and an American-type grill. Made in Gorky, it is powered by a new ohv gas engine employing a system of two combustion chambers claimed to improve fuel economy.

The inlet valve for each cylinder is in the small pre-combustion chamber in the head, where the mixture is fired by the spark plug, igniting the main charge in the wedge-shaped chamber above the piston which is exhausted in the normal manner. This six-cylinder unit of 212 cu in. displacement has a rating of 85 hp at 3000 rpm.

Among other design features are a water heater on the principle of an oil burning stove for cold-weather starting, and an oil cooler in front of the main radiator. Load rating of the two-axle truck with 145-in. wheelbase is four tons.

Largest Soviet machine at Brussels is the MAZ-530 with a 29-cu yd dump body rated at 40 tons. The under-frame of this welded structure consists of square-section hollow members that act as heating ducts to prevent the load from freezing in sub-zero temperatures. Engine exhaust is piped through these channels when the body is lowered.

The engine is a 2336-cu in. V-12 Diesel developing 450 hp at 1800 rpm. It drives through a fluid coupling, three-speed planetary gearbox, and individual propeller shafts to the two rear axles. Front suspension is by a single transverse leaf spring, while the rear axles are sprung on a pair of centrally-pivoted semi-elliptics. The 35-ton machine with 193-in. wheelbase is made in Minsk, and has hydraulic steering, 18.00 x 32 tires, and a top speed stated to be 18 mph.

AUTOMOTIVE INDUSTRIES, August 1, 1958

*Brussels, Belgium*



Forty-ton MAZ-530 has the platform of its dump body heated by exhaust gases ducted through the hollow under-frame members to prevent load freezing in cold weather.



ZIL-157, a 4½-ton six-by-six, has large-section tires with provision for varying inflation while in motion.

Six-cylinder engine of the GAZ-52 has two combustion chambers in the overhead-valve head. Front end design features hooded headlamps and wide grille.





# PLASTICS . . .

## Drive Ahead in AUTOMOTIVE FIELD

**P**ART I of this two-part article was devoted to automotive applications of thermosetting plastics and appeared in the July 1 issue of *AUTOMOTIVE INDUSTRIES*. This second part describes some of the numerous applications for thermoplastics in automobiles.

### THERMOPLASTICS

The term "thermoplastic" is applied to resins (plastics) which soften when heat is applied and harden upon cooling. By alternate heating and cooling, they can be reshaped again and again. Thermoplastics include the acrylics, cellulose, fluorocarbons, nylons, polyethylenes, polystyrenes, and vinyls.

#### Acrylics

Acrylics comprise monomers and polymers of acrylic, substituted acrylic, and methacrylic acids, their salts, esters, and other derivatives, such as nitriles and amides. In addition to clarity and good optical properties (not all variations are as clear as the methacrylates, however), the acrylics have low specific gravity and water absorption, high dielectric strength, and good shock resistance. The two principal suppliers are Du Pont Co. (Lucite) and Rohm & Haas Co. (Plexiglas).

The acrylics are found primarily in the body, electrical system, and accessories of the modern car. They are used extensively for both interior and exterior decorative and functional purposes. Molded easily in various shapes and sizes, acrylic has become the standard material for tail light lenses. Other electrical system uses include parking lights, directional signal lights, and back-up light lenses. Instrument lenses are made of the material, and it is used for edgelifting and for piping light. Acrylic lacquers are continuing to gain in popularity for automotive finishes.

Hood and horn button medallions, control knob rings, instrument panels, and door liners typify other applications for the material. First-surface metalized acrylic, for example, is used in the 1958 Ford car instrument panel and hood medallion and the Ford tractor hood medallion. It is also being used in the 1958 Imperial for door liner panels and in decorative form on the instrument panel background.

The first significant application of first-surface metalized acrylic was in the 1957 Ford speedometer

### PART II

Many New Developments in  
Thermoplastic Materials Of-  
fer Intriguing Possibilities for  
Vehicle Usage

By Andrew W. Shearer

dial. The 1958 version of this part is even larger in size. By way of contrast, second-surface metalizing (from the back of the part) has been used for many years. This is part of the process used to achieve a three-dimensional effect in dials, lenses, bezels, and medallions.

#### Cellulose

The cellulose is prepared by various treatments of carefully purified cotton linters or wood cellulose with a high alpha-cellulose content. The four major types are acetate, butyrate, nitrate, and propionate.

Cellulose acetate is a versatile, light, and stable material noted for its toughness, colorability, and ease of molding. Although it was supplanted some years ago by polyvinyl butyral as an automotive safety glass interlayer material, cellulose acetate has been widely used for interior decorative trim and all types of knobs and buttons; a newer use is in automotive air conditioner parts.

Cellulose acetate butyrate is characterized by tough-





One of the new applications of Moplen polypropylene, made by Montecantini of Italy is this distributor cap. It can be injection molded to cut down on production costs.

Sparkling tail lights of the 1958 De Soto are visible for great distances because of the excellent optical properties of Lucite acrylic resin (Du Pont Co.).



Reservoir of the Trico window washer on the 1958 Chevrolet Corvette is molded of Hi-fax high-density polyethylene made by Hercules Powder Co. (Trico Products Co.)



Helping to cut down on sound and vibration in the Edsel is a grommet-like part formed from Geon plastisol and foam. The steering column spacer is rotationally cast with a tough outer skin of plastisol. Vinyl foam is then injected into the interior cavity and fused in place. Sun Rubber Co. makes the parts using B. F. Goodrich Chemical Co., polyvinyl materials.



**Bushings of a composition based on Zytel nylon resin are used in torsion bar suspension system of tandem axle trailer. Eight main hanger bushings and 16 shackle bushings are employed. (Du Pont Co.)**

ness, high impact strength, resilience, light weight, weather resistance, and almost unlimited colorability. Its automotive applications include: steering wheels, armrest bases, interior knobs, headliner bows, seat hinge covers, brake lever handles, escutcheons, instrument panel lenses, and other panel parts. A new application for Tenite (Eastman) butyrate is for a sun visor on the 1958 Lincoln. Tail light lenses of the material are used on the 1958 Oldsmobile.

Oldest of the synthetic plastics, cellulose nitrate in side curtains was the first significant application of plastics in the automobile industry back in the early 1900's. It was subsequently used, after the advent of the closed car, in sheet form as an interlayer for safety glass. However, it was soon supplanted in this

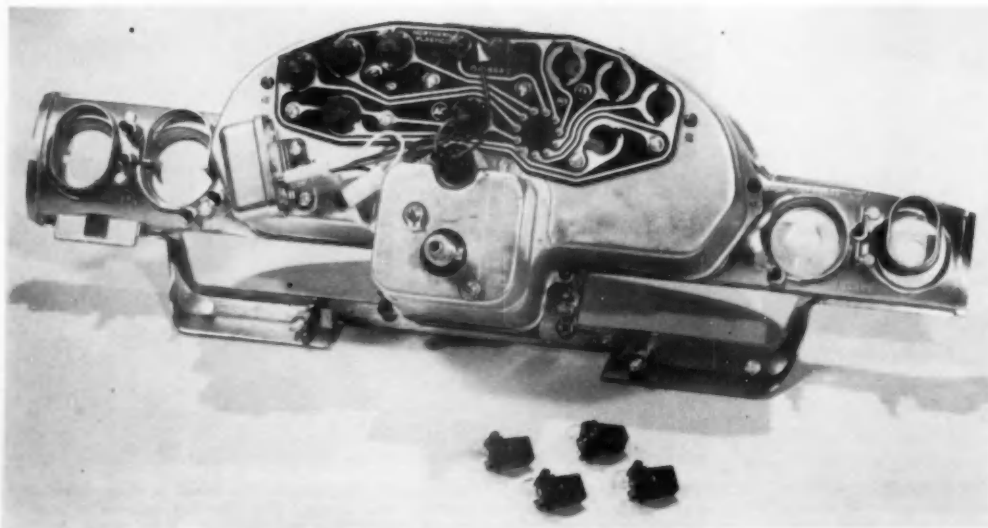
application by cellulose acetate which, in turn, gave way to polyvinyl butyral. While cellulose nitrate is tough and cheap, it is inflammable and cannot be injection molded.

Cellulose propionate is the newest of the commercial plastics. At the time of this writing, the principal propionate is Forticel, produced by Celanese Corp. of America. Available in a number of formulations and range of colors, it has good form retention, dimensional stability, impact and tensile strength, and weathering characteristics. Its automotive applications are similar to those for butyrate—moldings, steering wheels, control knobs, arm rests, etc.

### Fluorocarbons

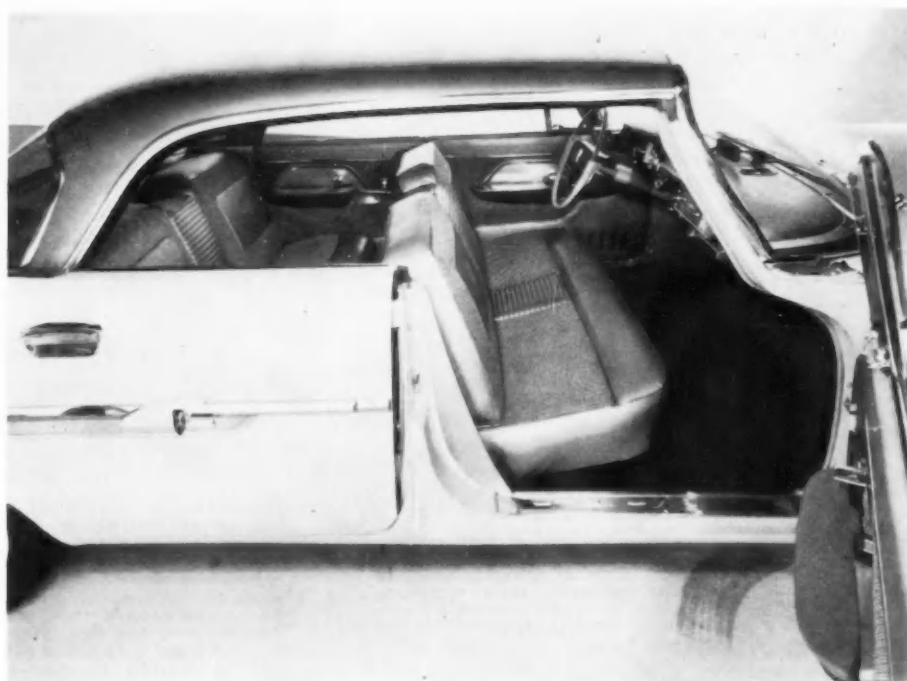
A group of very inert plastics is variously known as fluorothenes, fluorocarbons, and fluorochemical plastics. They are chemically characterized by having a large percentage of the hydrogen directly attached to the carbon replaced by fluorine. One part of the group consists of the polymers of trifluorochloroethylene; included in this category are Bakelite's fluorothene and Minnesota Mining's Kel-F (formerly M. W. Kellogg). These are available as resins and dispersions which have high stability and strong resistance to chemical attack. Oils, greases and waxes are also produced from these materials.

Another part of the general fluorocarbon group, more specifically called TFE-fluorocarbon resin, has the trade name Teflon (Du Pont). It is completely inert to nearly all chemicals and solvents, has negligible water-absorption, is unaffected by outdoor weathering, and is useful for continuous service up to 500 F with good low temperature properties as well. In addi-



**Printed circuit plate in Oldsmobile is phenolic, while lamp sockets going into circuit block are nylon.**

Bodycloth in Chrysler New Yorker four-door hardtop is a semi-textured filament viscose and copper metallic fabric. Seat backs have a vulcanized crest on a vinyl center panel insert. Doors have embossed vinyl upper and lower areas with Mylar rectangular ornamentation on lower part.



tion, Teflon at high loads has the lowest coefficient of static friction of any bearing surface. This particular property makes it useful in such automotive mechanical parts as clutch pedal bushings, brake systems, transmission seals, power steering and suspension systems, etc.

Filled Teflon and reinforced constructions are winning increasing attention from the automotive designer as a bearing material because of their ability to carry high loads. It is also finding applications in: clutch lever bearings; thrust bearings for seat adjusters, door locks, speed control devices, and transmissions; bearings for Diesel engine governors; odometer bearings; bearings for bus door controllers; universal joint bearings; and sleeve bearings in carburetors.

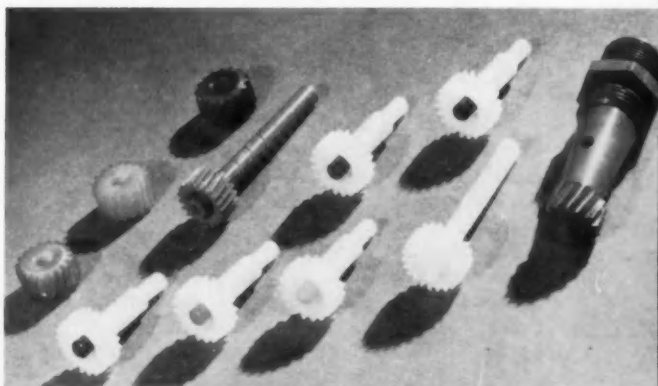
Other current and potential applications for Teflon include: power steering shaft seals, piston ring, and locknut gasket (Saginaw); thermostat valve seats or seals for GM cars (Harrison Radiator); diaphragm for transmission switch on Mercury (King Seely); air suspension throttle valve; piston seal for fuel injectors; ignition wire insulation; engine piston rings; valve stem seals; and coatings on window channels and weatherstrippings.

### Nylons

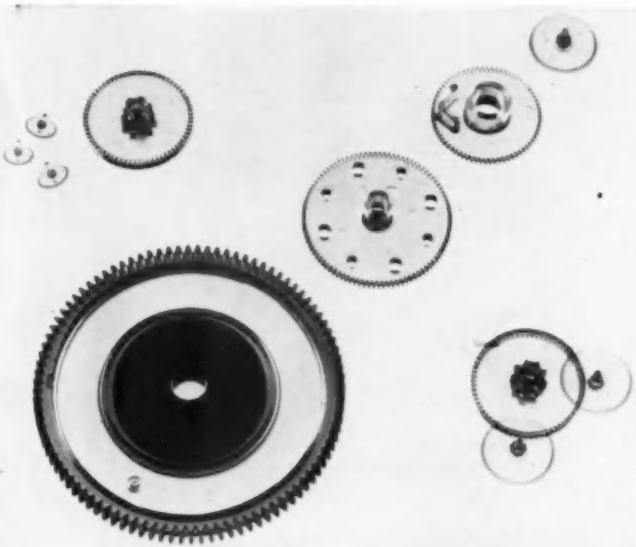
Nylon is a generic term for a group of materials known technically as polyamides. Already well known as a textile material and monofilament, nylon was introduced as a plastic molding composition by the Du Pont Co. in 1946 under the trade name Zytel. Today, nylon molding powder is used for the manufacture of thousands of items by injection molding or extrusion techniques.

It is estimated that since 1950 the use of nylon in passenger cars has increased by over 700 per cent. The growing importance of nylon as an engineering material in the automobile industry is attributed to its outstanding combination of properties and the readiness with which it can economically be molded into many intricate forms and shapes. The principal characteristics of nylon which appeal to the automotive engineer and designer are: good mechanical properties, including impact, tensile, flexural, and shear strength; good heat, abrasion, and chemical resistance; low coefficient of friction; and good electrical properties.

The first functional automotive application for nylon was in dome light lenses, where its heat resistance,



A selection of speedometer gears molded of Zytel nylon resin. (Du Pont Co.)



Gears molded of Lexan polycarbonate resin. In several, the assembly of gear, pinion and shaft is molded as one piece (General Electric Co.).

toughness and ability to withstand discoloration are important. Practically all cars today are equipped with one or more interior lenses made from molded nylon.

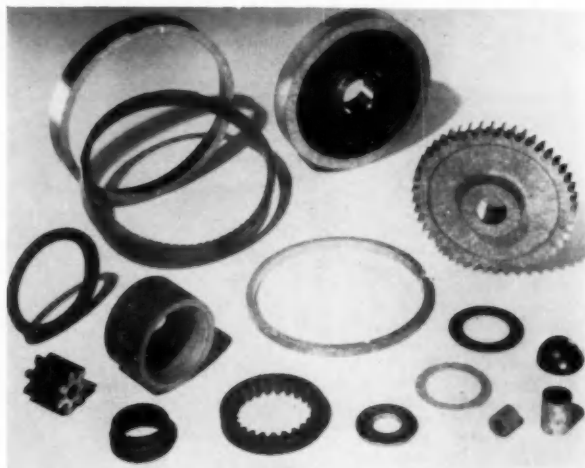
The toughness and low friction characteristics of nylon make it popular for such applications as door latch wedges; front-seat back stops in two-door models; gears for windshield wipers; clutch cross-shaft bearings; spring interliners; brake pedal bushings; window crank handle bearing plates and regulator rollers, etc. Quiet operation without lubrication is provided in many of these applications.

The good electrical properties of nylon account for its widespread usage in connectors, fuse holders, instrument lamp bases, horn switch insulators, coil forms, and miscellaneous parts for small motors.

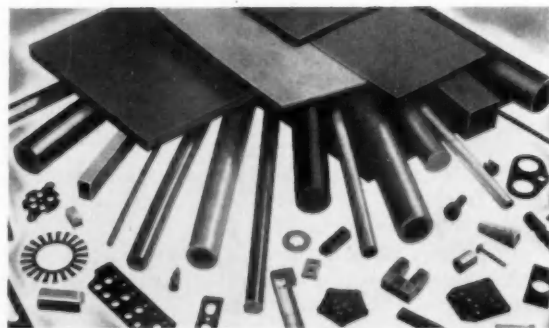
One of the most interesting functional applications of nylon is in speedometer pinion gears. Offering smooth, quiet operation, the nylon parts do not require the close tolerances required for steel gears in this application. At first, nylon was used to make just the gear, but now it is being used to make the pinion shaft also.

Nylon tubing has proved to be quite successful. Flexible tubing products of nylon are being used for centralized pressure lubricating systems, fuel lines, flexible shaft housings, and pneumatic lines for shock absorber systems.

A partial list of other nylon applications would include such functional parts as: accelerator bushings; air conditioner ducts and grilles; speedometer take-off gears; ball joint suspension bushings; carburetor parts; hardware (both inside and out); fuel pump and filter parts; distributor rubbing blocks; tire valve caps; brake camshaft bearings; and steering bushings and thrust washers.



Shown here is an array of products made from Pyrotex (trademark) thermosetting plastic, which is laminated, molded, and machined into precision parts. Included in the line-up are such parts as oil pump gears, engine mounting and camshaft bushings, timing gear, thrust washers, automatic transmission friction cones, etc. The heat and flame resistance, dimensional stability, high strength-to-weight ratio, and other properties of the material make it suitable for a number of automotive, aircraft, and industrial applications (Equipment Sales Div., Raybestos-Manhattan, Inc.).



Continental-Diamond Fibre laminates and fibre materials in sheet, rod and tube form have a variety of automotive applications. These CDF products—laminated plastics (Dilecto, Di-Clad), molded macerated laminates (Celaron), vulcanized fibre, resin impregnated fibre (Vulcoid), and laminated mica sheets (Micabond)—are all used in the manufacture of parts for passenger cars, trucks, and other transportation equipment.

### Polyethylenes

For purposes of simple identification, there are two basic types of polyethylene—low density and high density. The former is the familiar flexible type which is polymerized with oxygen catalyst at high pressures and temperatures. The latter is the new semi-rigid type that is produced with ionic catalyst at comparatively low pressures and temperatures.

The polyethylene resins have excellent electrical properties and good resistance to water and most organic chemicals. They can be molded, extruded, calendered, and applied in films.

Until recent years, polyethylene was used primarily in the automotive field as a film to protect seat and



door trim panels in transit and as a cover for cars during storage on open decks of ships. Currently, however, many practical functional uses are being found for molded polyethylene and film.

Film is used as a water shield between the door foundation board and inner door panel of the modern car. It can be satisfactorily bonded to the steel panel and is flexible enough to follow the contour of complicated shapes. The transparency of the film allows workmen to install brackets, etc., quickly because they can see locations involved. Punched holes and slots are unnecessary because sheet metal screws and foundation board fasteners can be pushed easily through the film.

Polyethylene has been successfully used for several years as a full length spring interliner and is currently found also in storage battery caps, ball joint dust covers, and wiring insulation. Other applications, as reported by Du Pont Co. for its Alathon polyethylene resin, include floor mat fasteners, lamp socket spacers, and cable clamps.

One of the most promising of the new high-density polyethylenes is Hi-fax made by Hercules Powder Co. Lightweight and rigid, it has excellent abrasion, temperature, and chemical resistance characteristics. A current automotive application is the reservoir of the window washer on the 1958 Corvette (see illustration). A number of other applications are under evaluation for 1959 cars, including: air conditioner, heater and air ducts; battery parts; instrument panel; gas tank air vent and float inlet; sun visor; window channels; spring-leaf inserts and liners; radiator overflow tube, etc.

Another of the new rigid polyethylenes is Fortiflex—an olefin polymer based on ethylene—made by Celanese Corp. of America. While still too new to have established itself, it appears to have a good future in the automotive field. One truck manufacturer will probably use it in its 1959 models for a fuel line. Grex 100 (W. R. Grace) is another example of a new high-density polyethylene with good potentials.

## Polystyrenes

Styrene monomer is the principal material from which styrene polymers and copolymers are made. Styrene may be polymerized alone, or it may be copolymerized with other monomers by bulk, suspension, emulsion, and solution polymerization processes. Polystyrene and modified polystyrene are available in three general classifications: 1) general-purpose; 2) impact types; and 3) chemical-resistant.

This widely used thermoplastic has a low specific gravity, good dimensional stability and resistance to water and chemicals, and fine clarity. It is readily moldable and has good mechanical strength. Polystyrene molding materials are usually fabricated by high-speed, automatic injection molding.

Styrene polymers and copolymers are beginning to enjoy real success in the automobile industry. For example, Dow Chemical Co. reports that its Styron (polystyrene) is being used in battery caps and spacers, while its Tyril (styreneacrylonitrile copolymer) is found in battery hold-downs and air conditioner housings. American Cyanamid says that windshield wiper mechanism parts on some 1958 cars are made of its Cymac methylstyrene molding compounds, and U. S. Rubber Co. states that one of its most promising products is a crash pad for dashboards fabricated of Royalite—a rubber-resin copolymer filled with a polyurethane foam.

Rigid plastic sheet materials which can be vacuum formed are now important trim items in automobiles; in general, they are mixtures of copolymers. For example, Cicolac resin, made by Marbon Chemical Div. of Borg-Warner Corp., is now in production for vacuum-formed headliners, crash pads, kick pads, and pillar post covers. Moldings of the material are used for electrical components, condenser housings, radio speaker grilles, knobs, escutcheons, line connectors, and battery hold-downs.

Applications of Cicolac under evaluation are arm rests, horn housings, push buttons, switch housings, trickle valves, and switch cams. A list of some 20 items under consideration includes steering

wheels, speedometer and ignition housings, battery cases, windshield washers, light lenses, bumper seat-stops, seat hinge covers, and window bearings.

## Vinyls

The term "vinyl" covers both polymers and copolymers, including vinyl acetate, vinyl chloride, vinyl chloride-acetate, vinyl acetal, vinyl alcohol, vinyl butyral, vinyl carbazole, and vinylidene chloride. Produced in either rigid or flexible forms, the vinyls as a group have toughness, chemical inertness, and good electrical properties. They can be readily modified with plasticizers and other ingredients.

One of the first and most widely known plastics in the automotive field is polyvinyl butyral which is universally used in the manufacture of safety glass. Together, the Du Pont Co. and Monsanto Chemical Co. produce nearly all the polyvinyl butyral interlayer sheeting used in the U. S. For many years, all new cars have been required by law throughout the 48 states to have laminated safety glass in windshields.

Yards of vinyl sheeting, vinyl-coated fabrics, films, and related materials are being used by automobile manufacturers to make interiors more beautiful, more serviceable, and easier to clean. Seating, door panels and side wall areas, arm rests, headlinings, scuff pads, instrument panel coverings, sun visors, etc., typify the many applications of vinyls in the car of today.

Vinyl-coated fabrics that can be heat-embossed and adhered through padding to door foundation trim panels and backing fabrics have enabled the interior stylist to create appealing door panels and seat inserts that are practical and durable. Vinyl laminates on sandwiches of cotton backing and rubber have become popular convertible deck materials, while certain imitation carpet facings are constructed from vinyl-coated burlap or jute.

Perforation of coated sheeting permits the use of vinyl as a headlining material. Transparent polyvinyl chloride sheeting finds wide-

(Turn to page 76, please)



The special boring machine operates on both ends of the rocket launcher simultaneously. Two tubes wait in standby rack.

## Special Machines at Chance Vought

**Economical Production in Limited Quantities Achieved by Methods Which Do Not Require Large Capital Investment**

**A**IRCRAFT companies frequently have production problems that involve unusual or irregular contours of parts, or the need for low-cost production of limited quantities of parts. Where economic factors will permit, a special machine can be designed to do the work. In many cases, however, the problem must be solved by methods that will not require investment of a large amount of capital, and here the ingenuity of company personnel may provide a solution.

At the Chance-Vought Aircraft, Inc., plant at Dallas, rocket launching tubes for the F8U-1 Crusader,

a supersonic Navy fighter, were required by the thousands. The tubes, about 10 ft long, launch the 2.75-in. rocket. They are about 0.050 in. thick in the wall section, with three internal guide rails, or ribs, and made in high strength aluminum alloy. A process was worked out with Hunter Douglas Aluminum Corp., the supplier, whereby the rocket launcher was cold impact extruded with the inside ribs and breech cap an integral part of the extrusion. It was then required to face and bore one end, and to face the other so a plug could be welded to it. Doing the work on a turret lathe re-

quired about 5 min per tube. A special machine was finally developed at Chance-Vought in which both ends of the tube could be machined simultaneously, and the operation completed within 30 sec. The tube was held in an air clamp, with a central control box to permit the operator to load the tubes from a standby rack and control the machining operations.

In another job, the main beam of the wing of the Crusader had to be finished perfectly flat and with a difficult taper so that the wing's skin could be fitted over it to give a perfect seal. The wing is an integral fuel tank, and fuel

leakage might result if the faying surface of the beam did not have a precision taper. The only way to obtain this seemed to be by hand filing, a slow and costly process. Not more than 0.001 in. cresting was permissible on each side of the beam face, making the problem difficult for a hand sander.

To mechanize the operation, a special sanding machine using an abrasive belt was built from parts salvaged about the plant. With the taper built into the machine, the time for smoothing the beam surface was reduced to one-fifth that for the hand operation.

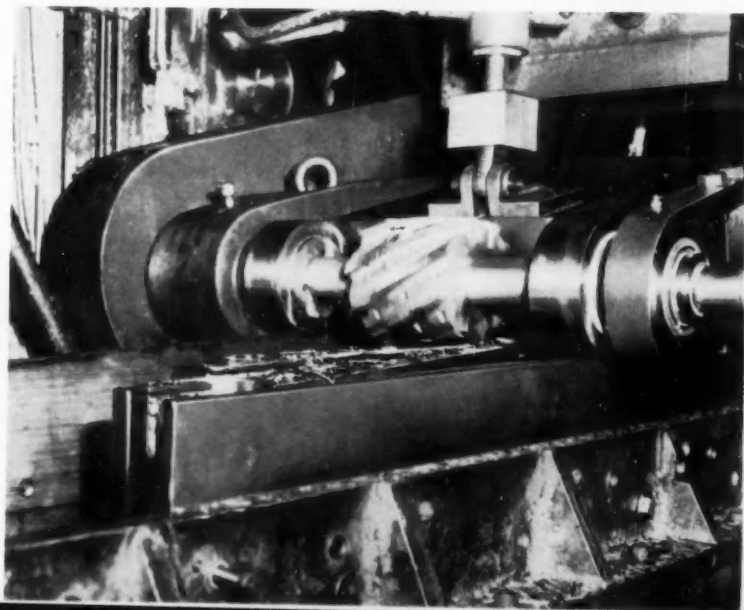
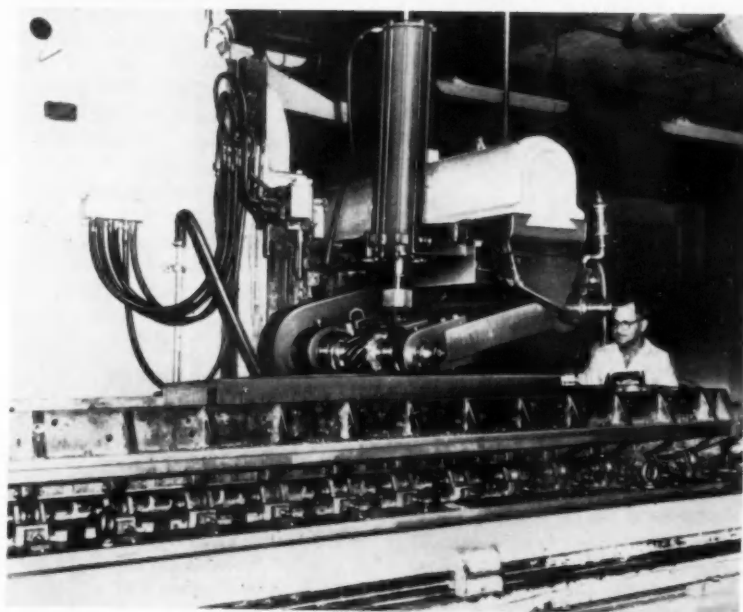
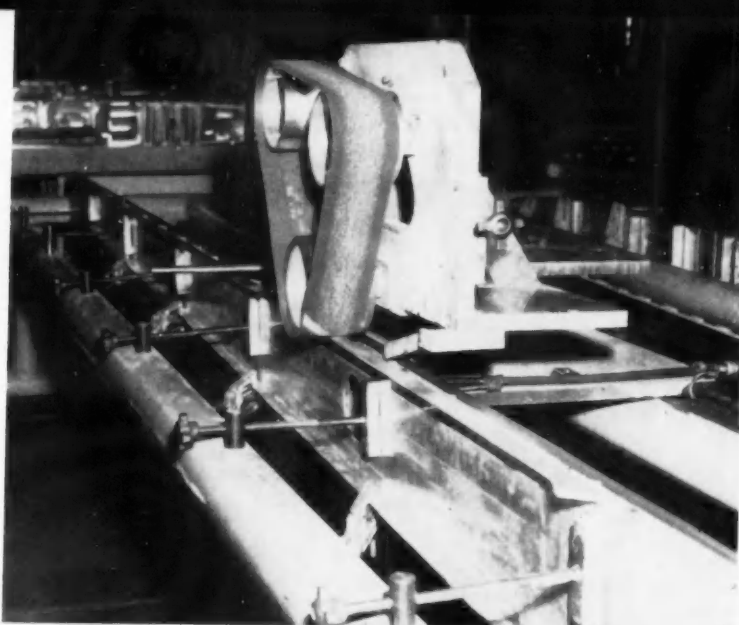
In an operation involving the milling of the same swarf simultaneously on two steel parts, a standard machine was converted to do the job, with the aid of cutters and guides. Two extended pivot arms were attached to the standard overarm of a Cincinnati Horizontal Hydro-Tel miller, and a special tool setup suggested by Goddard & Goddard Co., consisting of their milling cutter gang and Briney guide bearings on an arbor, was mounted between the pivot arms. A pressure cylinder coupled to the pivot arms holds the cutters against the work. Templates of the contour to be reproduced are mounted along each side of the table, and the guide bearings follow over the templates to give the desired motion to the cutters. Helical inserted carbide-tip cutters are used.

Because the guide bearings are split, the outer race can travel over the templates at the feed rate while the inner race turns at the same number of rpm as the cutter.

**—TOP**  
Belt sander, built from salvage parts, finishes the surface of a main wing beam.

**—MIDDLE**  
The adapted milling machine mills twist in two steel surfaces.

**—BOTTOM**  
Special bearings roll over templates to guide the gang cutters.



# AUTOMATION NEWS REPORT

## AUTOMATIC CONTROLS

### PRODUCTION—VEHICLES—AIRCRAFT

By Samuel Cummings

#### SELF-CORRECTING DATA PROCESSING MACHINE

A new method of correcting data processing errors at electronic speeds has been announced by Datamatic Div. of Minneapolis-Honeywell.

The new system, called Orthotronic Control, was hailed by M-H president Paul Wishart as "the most significant break-through in the state of the art in the past ten years."

The new control literally recreates source data and provides instant data reconstruction of lost or garbled words or figures when discrepancies are spotted at any one of a series of check points throughout the system.

Until now systems for checking and double-checking for transient errors have been developed and used, but this is the first method to make data-processing machines self-correcting, the company said.

Richard M. Bloch, inventor of the new method, said the key development of Orthotronic Control is that it actually regenerates data a split second before it is processed whenever a mistake shows up.

This is accomplished, he explained, by combining mathematical principles with electronic performance to constantly cross-examine each fragment of every letter and figure as it is measured in the dot-dash impulses of speeding electronic tape. By sensing and correcting errors in the code signals which make up fractions of individual letters and digits, he

added, lost, damaged or garbled words can be restored to their proper sense and sequence.

The company expects the new system will eventually replace present built-in detection devices which signal an error, but require tedious manual searching of files or time-consuming re-runs of the tape before it can be located.

The new system is now in production at Datamatic's two plants near Boston, the company said, and will be ready for service with Datamatic 1000 machines in 1959.

#### J&L USES ANALOG COMPUTER

Jones & Laughlin Corp. is using an analog computer in its Research and Development Dept. to solve many complex problems of steel-making.

The computer, the first to be purchased by a steel firm, is being used initially to improve process control, analyze automatic control systems, and study information-handling methods to improve data-collection techniques.

The computer, which was designed and built by Electronic Associates, Inc., will allow J&L research engineers to simulate difficult metallurgical processes electronically and thus save many hours of involved figuring.

For example, to determine what happens in a metallurgical process where certain factors, such as time and temperature, may be changed for more efficient results, the older method was to build a pilot model, or a full-scale plant, and make all the changes and combinations of changes one at a time.

This also can be done mathematically, but the computations are so involved that a mathematician might be years in reaching a solution.

The analog computer—a combination of both methods—serves as a scale model, bridging the gap between the mathematical symbols and physical processes. In simulating a process, the computer acts as a miniature plant without the time limitations and expense.

Data from the actual process are used to establish the model on the computer. When the computer model behaves the same way as the actual process, accurate studies of different effects on the process can then be begun on the computer.

#### CONVAIR USES TAPE-CONTROLLED MACHINE

Convair (San Diego) Div. of General Dynamics Corp. announced it is building aircraft and missile wind tunnel models by tape controlled machines instead of by hand.

Convair engineers said the new technique will cut model lead time from drawing board to wind tunnel testing by 90 per cent.

First product turned out at Convair by the new method—a one-twentieth scale model of the wing for an F-106 jet interceptor—was produced with a digital computer, a numerical control director, and a Giddings & Lewis profiler. The profiler is a horizontal mill capable of cutting materials in compound curves within the limitations of three axes, using instructions on a magnetic tape.

Starting with minimum drawings, Convair aerodynamic engineers calculated formulas to be fed to the computer. From the resulting data, which was run through the numerical director unit onto magnetic tape, numerical control engineers reproduced in one unit the upper and lower surfaces of the new F-106 wing.

Normally model work in metal is accomplished through the use of templates—working each section of the wing or fuselage over and over with electric grinders and hand files.



# ***Small Development and Production Programs***

**Discussed at**

**By**  
**Joseph Geschelin**

## **INDUSTRY MISSILE AND SPACE AGE Conference**

**A**CCORDING to news reports, Army Secretary Brucker disclosed at the White Sands Missile Range that the Army is committed to make one or two probes at the moon some time in the near future. When that time comes, he said that the Chrysler-built Jupiter will be the booster.

Meanwhile, back in Detroit almost simultaneously—during June 30 and July 1—a surprisingly large group of industrialists and civic leaders turned out for the Industry Missile and Space Age Conference, sponsored by the Aero Club of Michigan. On the subject of space flight Major General John P. Daley, Director of Special Weapons, Office of Chief of Army R & D, drew attention to an Army directive earlier this year for the launching of two and possibly three additional earth satellites, and one or possibly two lunar probes.

### **Accelerated Air Force Programs**

These developments confirmed a statement by Lt. General Irvine, USAF that Sputnik I had no effect on the scientific know-how in the military establishment, except for the mounting of popular feeling that urged Congress to take immediate action on military expenditures. General Irvine said that the Air Force looks ahead 15 years and what is happening today is simply the result of advance planning over the years. Current developments mean that the Air Force must accelerate its programs from now on.

Considerable light was shed on missile development and industry programs. Despite the prognostication of many people, the military experts do not expect missiles to replace manned aircraft. While estimates vary, both General Irvine and General Twining estimated that missiles should take around 40 per cent of the budget, leaving some 60 per cent for manned aircraft.

### **Prime Contractors and Sub-Contractors**

Meanwhile, most of the attention at the Conference was centered upon the immediate problems of missile development and production to serve urgent military needs. Each of the services has its own unique approach to missiles development and production. The Air Force has its own R & D facilities,

selects a prime contractor to handle a program, works with the prime cooperatively. Navy, too, has its own R & D facilities, relies upon a single prime contractor for each major program. In such programs Navy has from 14 to 16 large sub-contractors and three to six smaller ones. The Army's Missile Command does all of its own R & D work before a contract is awarded.

### **No Mass Production of Missiles**

One thing was made clear, although missiles take a lot of money, they are not made in large numbers, perhaps never will be. Consequently, there is no mass production in sight nor are volume methods desirable, in the main, because of the constant stream of engineering changes that comes every time a missile is fired.

That is the reason too why each prime contractor must rely upon a large number of small companies for sub-contracting. Such companies are much more flexible in action and should be better able to accommodate themselves to the myriad of changes that will continue without end.

While on the subject of missile procurement, it was made clear that the military as well as their prime contractors realize the importance of enlisting the brains and facilities of large numbers of sub-contractors both big and small. However, the need is for extreme specialization. This narrows the field materially. Moreover, as specialists are phased into a program and show competence as well as the ability to produce on schedule, the natural tendency is for primes to stay with the acceptable sources. Frankly, this means that there is little room for new sources unless programs are expanded or accelerated.

It does not mean that no new sources will enter the picture. But no one anticipates that large numbers of new sub-contractors will find business, except in cases of exceptional know-how in science and specialization.

*(Turn to page 80, please)*

# Fabricating Titanium Cases for Jet Engine Compressors

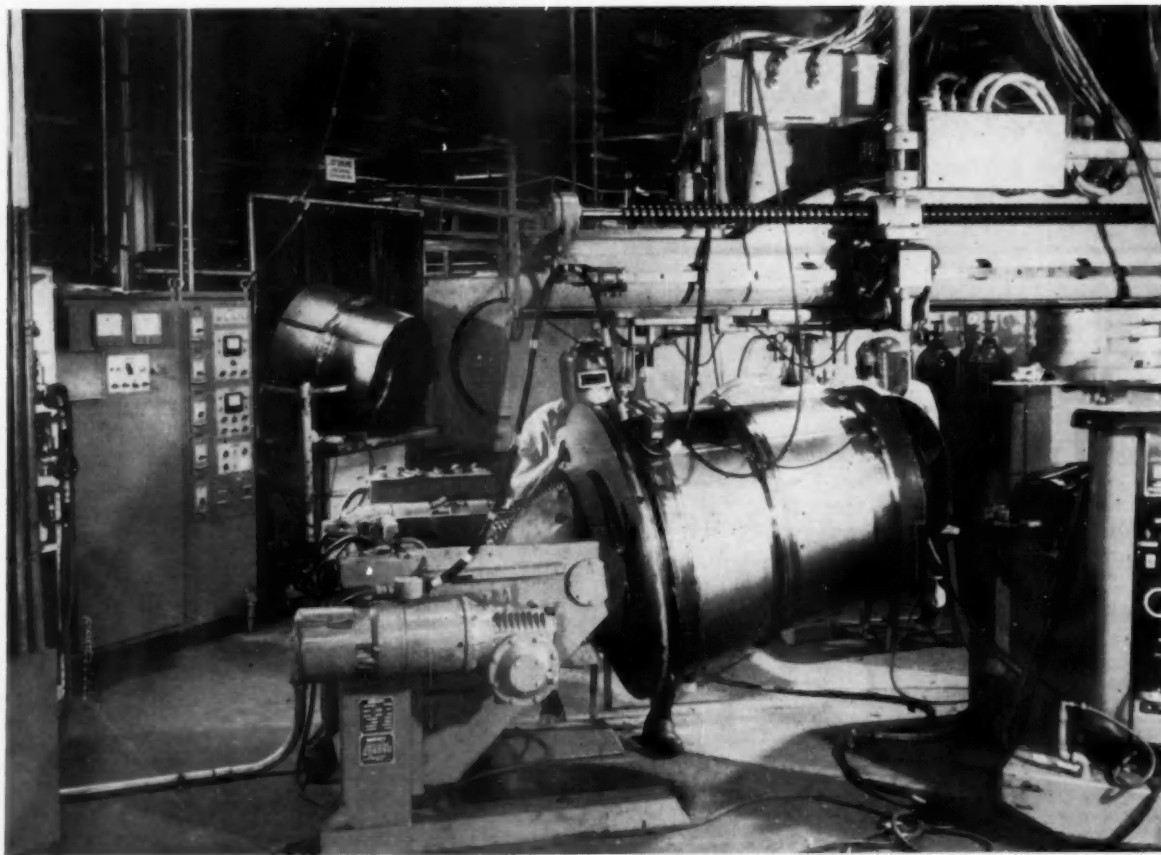
**I**N one model of the Pratt & Whitney J-57 jet engine, air is compressed in the low and high stage compressor sections to high pressure with temperatures going to approximately 650 F. To withstand these severe conditions and to keep weight to a minimum, the front compressor case on the engine is made of titanium; and the stator vanes and compressor blades are made of stainless steel. The stator vanes for the first four stages in the low compressor section are made of forged aluminum alloys. Titanium low stage compressor cases as well as stainless steel and aluminum vane and shroud stator assemblies are fabricated to close tolerances.

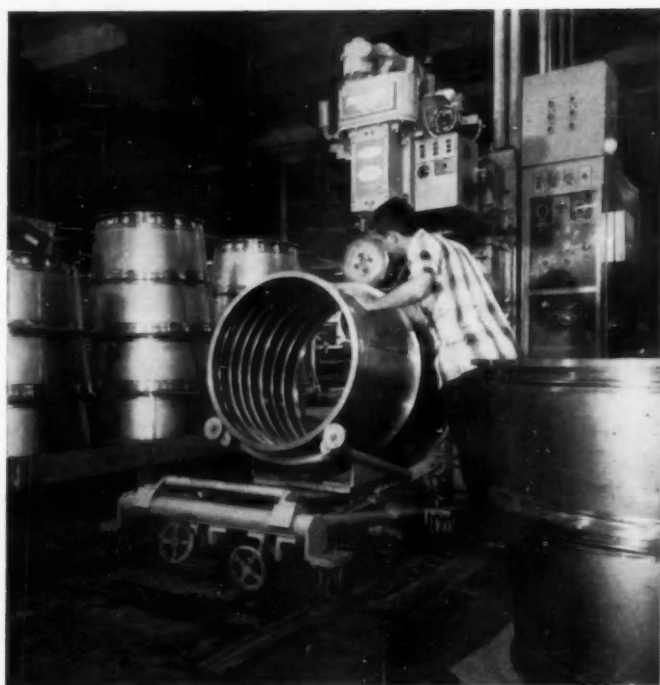
Titanium metal is generally regarded as difficult to

fabricate. It is difficult to weld because of the extreme readiness with which it oxidizes at elevated temperatures. It is difficult to machine because of a tendency of the metal to smear and tear, giving poor finish and inaccuracy to the work surface. Temco Aircraft Corp. has developed techniques to overcome these difficulties in its work with the metal.

Fabrication of the compressor case begins with titanium sheet. The sheet stock is laid out with the aid of templates into eight pieces, each forming a 90° segment of one of two frustums of a cone. The pieces are cut out with a saw, and are then rolled on a Farnum roll to curved form. The segments are then deburred and vapor degreased.

*Circumferential welds on the titanium compressor case are made on a radial welder*



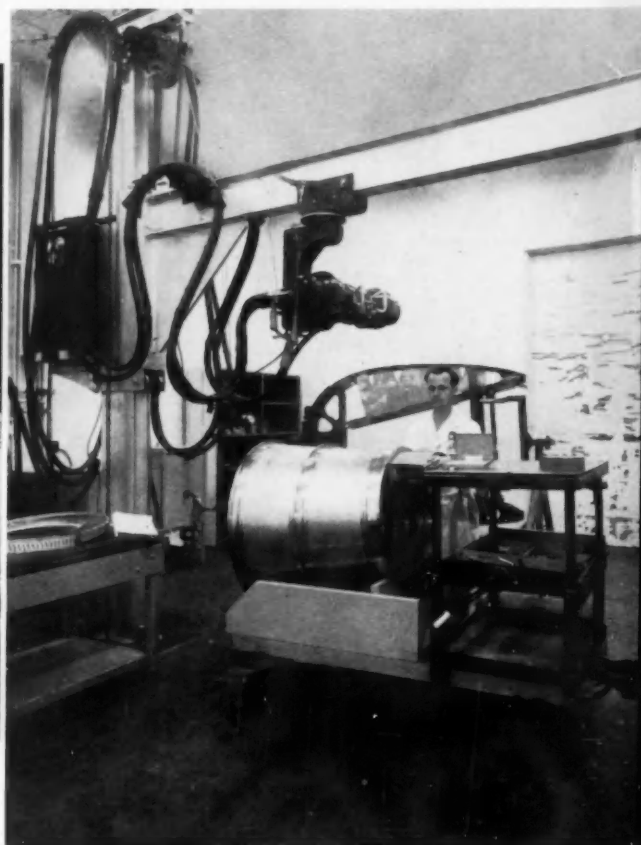


**Rings to support the stators are seam welded to the case**

Segments are then placed on a positioner under a Welduction Radial Arm Welder, for which two positioners are provided, one for longitudinal welds, the other for circumferential welds. The welder can be swung into working position over either positioner by means of the radial arm. The positioner moves the work after the electrode is positioned so as to make welding semiautomatic. To produce sound welds, shields have been made that fit the curve and slope of the work surfaces, and inside these, porous bronze filters are attached. Air is exhausted and the space inside the shield is flooded with argon gas. The shield is attached to the electrode holder, so as to enclose the electrode and the weld area, and is free to slide over the surface of the work as the positioner moves the work under the electrode. It trails over the line of the weld for about 8 in. just behind the arc, thus protecting the weld metal as it cools. This produces sound, oxidation-free, silvery bright welds. In this first welding operation, the longitudinal welds are made so as to form the segments of titanium sheet into two frustums of a cone.

The two conic sections are next expanded on a Grotnes expander to exact contour. Welds are inspected by X-rays, and the exact height of each of the two sections is set by facing on a Bullard vertical turret lathe. The two frustums of the cone are then returned to the Welduction welder, using the air-chucked positioner for the circumferential weld that joins the two sections into one tapering conic section. This positioner has an air clutch for regulating the feed of the work.

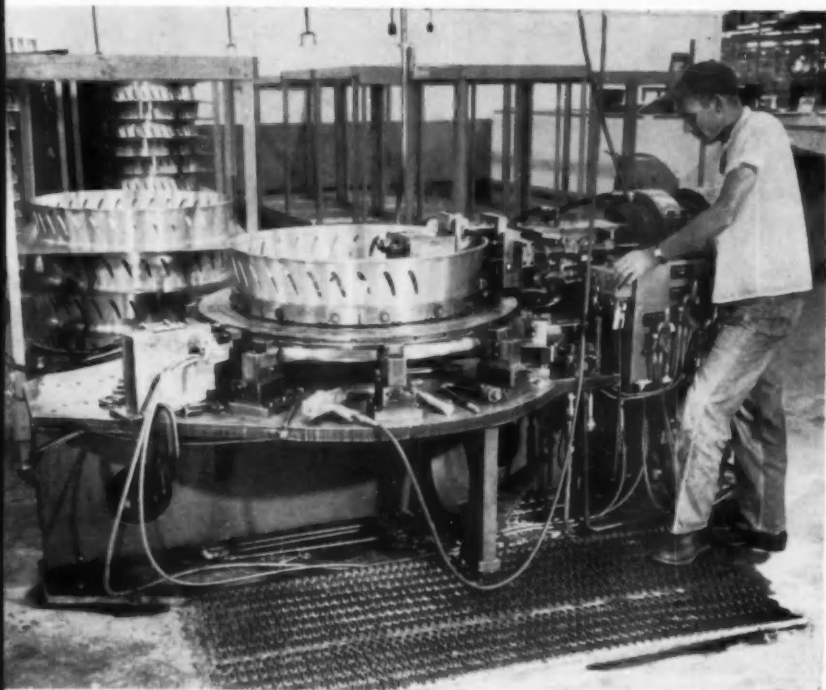
Bands are then welded inside the shell circumfer-



**Welds are x-rayed to insure against defects**

**Stainless steel vanes are driven into the outer shroud in a piercing machine**





**Outer shrouds are pierced for the aluminum vanes**

entially to establish the position of the stators or vane and shroud assemblies. This operation is performed on a Sciaky seam welder. The piece then goes to a Bullard vertical turret lathe, where the inside rings and outside flanges are turned accurately to diameter and

faced. The interior then becomes a series of stepped diametral rings inside a tapering shell, with 8 steps divided 4 into each of the two original frustums.

The piece is then given a careful dimensional inspection, using Boice gages for all diametral rings. Next

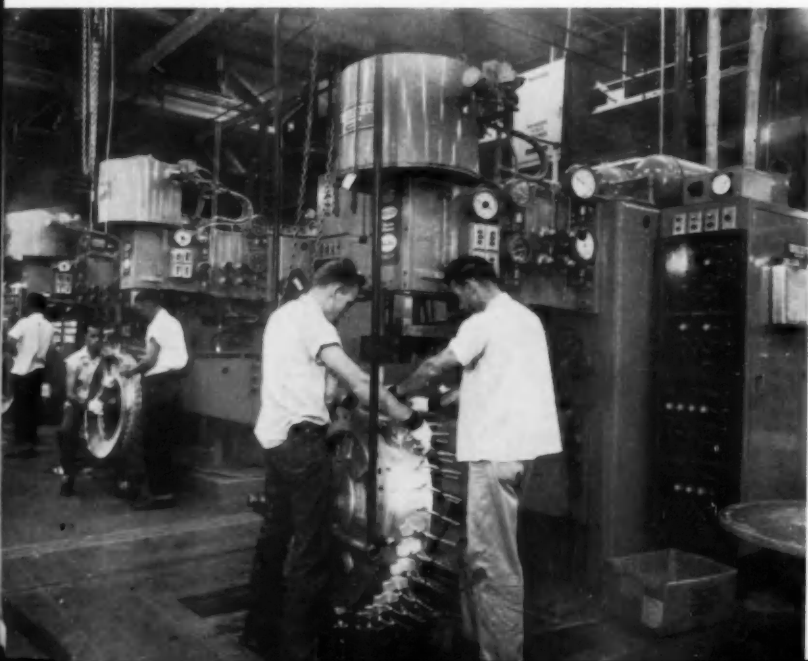
operation is drilling rivet holes at each end of the piece, and at the center flange. The holes are drilled on a special Temco machine that indexes 96 spaces, but drills only 92 holes, leaving the four spaces, 90° apart, for milling in notches for attaching the titanium anti-torque ring.

Temco's fabrication of vane and shroud stator assemblies begins with processing of the detail vanes. Aluminum vanes are individual forgings, and the stainless steel vane stock comes to the plant as forged strips. The strip stock is cut to length and contour formed in a small press, the ends of each vane being notched so as to permit its firm mounting in the stator shrouds. The vanes are then assembled to the outer shroud one at a time in a Danly piercing machine. When all the stainless steel vanes have been joined to the outer shroud, the inner ends of the vanes are forced through the inner shroud. Both ends are then welded in place. The welded assembly is then machined to close tolerances on a 54" Bullard vertical turret lathe, which uses automatic Manu-trol for tool position and cycling.

The aluminum vanes are spot-welded, and pinned to the aluminum shrouds. In the first stage rings, the outer shroud is first punched around its circumference for the airfoil of the aluminum vanes. Vanes are then fitted through the pierced, close-tolerance slots, held in place by small hand clamps, and the vane platforms are spotwelded to the shroud in a large Sciaky spotwelder while the whole assembly is held in a fixture. The inner shroud is similarly assembled and welded, the unit machined on the Bullard, and an air seal ring is riveted to the inner shroud. Both kinds of stator rings are then sawn in half, and dowel pins are inserted in the sawn ends to permit reassembly when the rotor is later installed in the engine.

The stainless steel blades in the vane and shroud assemblies for the latter stages are undercambered by hand, a blade at a time, to give the airfoil the form specified. Alignment of the blades is then checked with special dial indicator gages.

**Vane platforms are spot welded to the shroud**





# • • INDUSTRY STATISTICS • •

## WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending		Year to Date	
	July 12	July 5	1958	1957
<b>PASSENGER CAR PRODUCTION</b>				
Rambler	4,155	3,336	99,452	58,183
Total American Motors	4,155	3,336	99,452	58,183
Chrysler	1,605	1,298	32,850	75,680
De Soto	1,062	1,261	21,862	73,768
Dodge	2,948	2,350	60,751	179,565
Imperial	253	208	8,024	25,556
Plymouth	8,172	5,425	215,312	299,025
Total Chrysler Corp.	14,040	10,542	338,799	753,574
Edsel			6,944	
Ford	12,982	11,787	526,355	859,033
Lincoln	287	87	15,166	23,945
Mercury	538		64,800	174,670
Total Ford Motor Co.	13,807	11,874	613,265	1,057,648
Buick			133,095	243,555
Cadillac	3,231		80,282	89,054
Chevrolet	28,107	8,410	746,906	842,236
Oldsmobile	5,533		184,919	233,616
Pontiac	4,166		124,351	202,996
Total General Motors Corp.	41,037	8,410	1,299,555	1,611,057
Packard		62	1,571	4,599
Studebaker	24	1,050	19,065	33,348
Total Studebaker-Packard Corp.	24	1,112	20,636	37,947
Checker Cab	60	48	2,024	2,405
Total Passenger Cars	73,123	35,322	2,343,731	3,520,814

## TRUCK AND BUS PRODUCTION

Chevrolet	5,788	639	155,565	195,681
G. M. C.	1,045	750	33,479	36,824
Diamond T	120	69	2,981	2,734
Divee		48	1,488	1,827
Dodge and Fargo	1,229	1,027	32,354	43,630
Ford	3,054	1,728	120,269	193,802
F. W. D.	20	17	718	631
International	1,336	1,131	51,137	63,622
Mack	257	206	7,933	9,126
Studebaker	80	239	6,085	7,027
White	293	228	9,382	10,743
Willis	1,762	1,522	44,048	40,466
Other Trucks	50	45	1,870	2,415
Total Trucks	15,034	7,652	467,109	608,528
Buses	83	40	1,769	2,440
Total Trucks and Buses	15,117	7,692	468,878	610,968

## RETAIL CAR SALES BY PRICE GROUPS\*

### NUMBER OF CARS

Price Group	May		1957	
	Units†	% of Total	Units†	% of Total
Under \$2,000	5,248	1.34	1,036	.19
\$2,001 to \$2,500	254,862	64.92	344,740	63.81
\$2,501 to \$3,500	95,772	24.40	152,111	28.15
Over \$3,500	36,672	9.34	42,417	7.85
Total	392,554	100.00	540,304	100.00

Price Group	1958		1957	
	Units†	% of Total	Units†	% of Total
Under \$2,000	16,473	.90	17,434	.70
\$2,001 to \$2,500	1,162,629	63.41	1,528,378	61.37
\$2,501 to \$3,500	471,178	25.70	725,636	29.14
Over \$3,500	183,137	9.99	218,996	8.79
Total	1,833,417	100.00	2,490,442	100.00

### DOLLAR VOLUME OF SALES

Price Group	May		1957	
	Dollars	% of Total	Dollars	% of Total
Under \$2,000	\$ 9,348,802	.90	\$ 1,581,972	.11
\$2,001 to \$2,500	\$97,060,818	97.26	\$778,550,003	54.49
\$2,501 to \$3,500	\$274,531,449	26.33	\$431,700,610	30.21
Over \$3,500	\$161,757,910	15.51	\$217,080,277	15.19
Total	\$1,042,698,979	100.00	\$1,428,912,862	100.00

Price Group	1958		1957	
	Dollars	% of Total	Dollars	% of Total
Under \$2,000	\$ 29,236,292	.60	\$ 32,815,062	.50
\$2,001 to \$2,500	\$2,719,302,354	55.55	\$3,430,673,467	82.61
\$2,501 to \$3,500	\$1,329,989,359	27.17	\$2,045,460,752	31.38
Over \$3,500	\$816,438,341	16.68	\$1,013,033,856	15.53
Total	\$4,894,966,346	100.00	\$6,521,783,137	100.00

\*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

## REGISTRATIONS OF FOREIGN CARS

### First Five Months

1958	1957	1956
Volkswagen	33,866	26,556
Renault	14,231	8,318
British Ford	10,866	5,288
Hillman	6,335	4,414
Fiat	5,887	4,056
All Others	56,904	21,000
Total	128,089	66,692

## 1958 NEW REGISTRATIONS

Based on data from R. L. Polk & Co.

### NEW PASSENGER CARS

Make	FIVE MONTHS		FIVE MONTHS	
	May 1958	April 1958	May 1957	1956
Chevrolet	118,515	114,510	134,322	538,477
Ford	89,196	86,087	139,127	413,375
Plymouth	36,924	36,938	58,202	167,548
Oldsmobile	26,819	29,581	33,699	141,405
Buick	22,951	24,724	35,198	120,872
Pontiac	20,700	20,707	30,359	102,997
Rambler	18,847	14,468	9,164	61,264
Mercury	12,590	12,912	27,118	96,771
Dodge	11,924	12,781	25,332	57,799
Cadillac	11,959	12,749	13,165	57,292
Chrysler	5,299	5,709	9,973	27,551
De Soto	4,322	4,699	9,807	22,625
Edsel	3,355	3,491		18,749
Studebaker	3,000	3,740	5,129	17,266
Lincoln	2,327	2,609	3,071	13,530
Imperial	1,253	1,455	3,441	7,316
Metropolitan	1,289	1,037	1,036	4,574
Packard	252	355	534	1,437
Misc. Domestic	403	256	1,958	1,369
Foreign	30,751	29,367	15,689	123,515
Total—All Makes	423,484	416,255	506,324	1,957,752

### NEW TRUCKS

Make	FIVE MONTHS		FIVE MONTHS	
	May 1958	April 1958	May 1957	1956
Chevrolet	23,183	21,803	26,125	98,896
Ford	17,413	17,815	28,276	79,232
International	7,533	8,095	8,595	36,386
G. M. C.	4,733	4,890	5,651	21,162
Dodge	3,271	3,308	4,450	16,773
Willis Truck	987	1,255	1,212	5,238
White	1,131	1,115	1,446	5,055
Mack	1,125	1,109	1,257	4,640
Willis Jeep	459	581	504	2,393
Studebaker	424	439	644	1,899
Diamond T	245	259	268	1,175
Divee	175	227	282	925
Brockway	70	85	98	327
Kenworth	66	60	70	302
F. W. D.	19	41	25	177
Peterbilt	35	31	53	150
Misc. Domestic	71	80	90	340
Foreign	2,290	2,210	1,272	9,612
Total—All Makes	83,238	83,403	82,308	283,594

# Observations

By Joseph Geschelin

## Plastic Bodies

In view of the interest in reinforced plastic truck cabs, we checked recently with our friends overseas. One of the largest truck builders in England tells us they have used plastic cabs exclusively for a number of years. Vehicles range up to the largest built anywhere and they are in service all over the world, including desert country. Judging by their experience, when it comes to painting they have found it more satisfactory to mold colored plastic rather than to apply a color finish over a molded structure. They claim that the molded color finish gives greater endurance.

## Aluminum Engines

The several sessions on aluminum at the recent SAE Summer Meeting indicated that aluminum engines are closer than ever. Most promising are the hypereutectic aluminum alloys, i.e., high silicon alloys. There is the possibility that cylinder blocks produced from the right kind of composition may well dispense with the use of cylinder liners. Although the experimental phase of this development is not yet completed, the indications are that practical results are anticipated soon. One thing made clear was that foundry practice is quite critical and certain controls will be essential if the alloy is to be handled properly.

## Peeping Thomases

Premature stories about the 1959 crop of motor cars are singularly inaccurate this year. Some sources seized on the disclosure that General Motors was experimenting with aluminum engines to say

definitely that GM would come out this year with "small" cars fitted with aluminum engines. Suffice it to say aluminum engines have not yet reached the production stage at this writing, although they may well be in the works for 1960. Another "authoritative" source said recently that '59 will be a face-lift year with no activity in engines. We can assure you nothing can be further from the fact. Just wait and see.

## Thermo Electric

We are told that one of the major developments in air conditioning for motor cars is a thermo-electric system which takes heat energy from the exhaust system. By using waste heat, it operates without drain on the engine, dispenses with the refrigerant compressor. We have not seen details of the system as yet. We understand it was developed in England and several prominent companies in the USA are said to be working with it. Our informant believes the design should be available commercially within two or three years.

## Auto Glass

Indications are that glass areas in 1959 cars will be upped from 50 per cent and more. The trend is to still narrower pillars as well as a further encroachment of the forward end of the roof panel. We are approaching the stage envisioned some years back, namely an all-transparent upper structure, one that must contribute to structural strength. It was predicted at the 1956 ASC National Meeting that special plastics formulations might be available for this purpose. In fact it could be done now if we had plastics with glass-hard surface to resist abrasion.

## Magnetic Domains

Solid state physics has been brought to bear on the influence of magnetic domains on the behavior of ferromagnetic materials by the GMC Research Staff. One of the things they seek to uncover is what magnetism is and how domains are formed. This is being approached by a newly developed technique of growing single-crystal "whiskers" of various materials. Rapidly grown in the laboratory, these nearly perfect crystals exhibit unusual properties and offer an insight into the behavior of atoms and electrons in solids. GM researchers have shown conclusively that the single crystal whiskers with perfect geometry contain a very simple domain structure in the unmagnetized state.

## Gas Turbines

At the recent ASME meeting held in Detroit, Bowden and Hryniskak of England contributed an interesting survey paper on automotive gas turbines. Being more conservative over there, the authors visualize gas turbines dominating the motor car field within some 40 years. Apparently they do not see it emerge even in limited use in the near future.

## Radical Engine

Several issues back we commented on a so-called radical type engine. It has been developed by a truck manufacturer who shall remain unnamed until we get the word. Since then we have received notes from two different sources, each one saying he has a similar engine. Unless the three designs are radically different there may be quite a patent scramble in prospect.

# Special Tooling for TRACTOR CRANKSHAFTS

**E**LEVEN different sizes of forged steel tractor crankshafts, in types ranging from four to six throws, are machined at Caterpillar Tractor Co. Until recently, these were done on two machines—a center drive lathe for turning bearings, flanges, and stub ends, and a double-end drive machine for turning all intermediate bearings. The entire range of types and sizes is now being done on one machine, with the aid of some special tool-mounting devices. A Wickes double-housing, 36-in. center-drive bearing lathe cheeks, turns, and fillets bearings, flanges, and stub ends on each crankshaft.

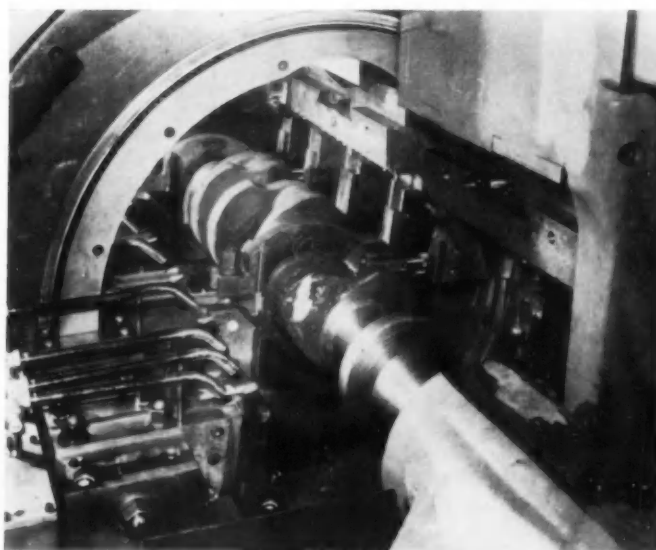
Set-up time is reduced by an hydraulic loader, by cam-controlled feeds, and by pre-set tooling. The pre-set tooling is done by using cutting tools mounted on special mounting plates, one plate for each size and type crankshaft to be machined. The single point tools are made up in gangs, formed tools being used where necessary, and the entire set is mounted in the tool room on a special mounting plate or bar. Changing from one type crankshaft to another is then a matter of removing one mounting plate from the machine and installing another. Some of the plates replace as many as 33 cutting tools. The plates are stocked in the tool crib.

The cutting tools are ground with a top rake of 15 deg and a cutting rake of 7 deg. Using high speed steel tools, tool life ranges from 10 to 50 crankshafts.

Crankshafts are spotted for the machine by a floor conveyor running in front of the unit. Each piece is lifted by a crane and placed on the loading rack at the right of the lathe. When the piece in the machine has been processed, the push-button hydraulic loader, after

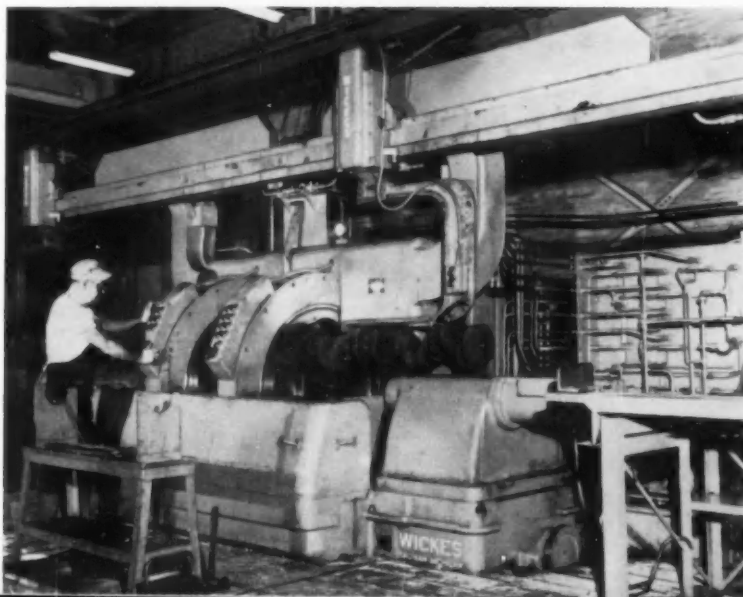
discharge of the completed piece from the left, picks up a crankshaft from the loading rack and moves it

into position from the right. The crankshaft is then chucked on previously milled locating spots, and all the surfaces are machined simultaneously. After an initial manual adjustment, the machine feed compensates automatically for whatever metal hardness is encountered. The feed mechanism on the hydraulic unit is controlled electrically by adjustable cams working off the slides.



*Gang tools, mounted on a special plate, simplifies tool changes when roughing different types of crankshafts.*

*Diesel engine crankshaft, a 505-lb steel forging, is being loaded into the bearing lathe. About 67 lb of metal will be removed.*



# METALS

*Price Advance in Steel Considered Inevitable, But There Is No Agreement as to the Timing of the Cost Increase*

*By William F. Boericke*

## No Steel Price Increase

One of the smaller steel producers sent up a trial balloon before the expected July 1 price rise in steel and announced a \$6 per ton increase for certain of its products. It added, however, that it was obliged to remain competitive and if its action were not followed by the major producers, the increase would be cancelled. Ten days later it was rescinded. U. S. Steel refused to make the move until the situation was "clarified." By mid-July the price situation was unchanged, although the wage increase and other benefits are estimated to have cost the industry about \$10 a ton with serious impact on operating profits.

It is generally admitted that a price advance in steel is inevitable, but there is no unanimity on the timing. It might come in August, or even after Labor Day. In the meantime there is no rush to buy steel or to rebuild inventories. Competition for orders remains extremely keen with emphasis on quick deliveries. In any event, it appears unlikely there will be any price advance until Congress adjourns. The steel industry is on the defensive, no matter how convinced of the merit of its contentions because of popular hostility to higher prices and political attacks. When it comes, the advance will probably be about \$5-6 a ton, or about half the estimated higher costs. The balance will have to be absorbed by the industry.

## Nickel Output Reduced Again

Announcement by International Nickel Co. of a third slash in out-

put since the first of the year, this time 20 per cent of its production, is vivid evidence of the sad effects of the current recession on demand for a metal that was in such short supply hardly more than a year ago. The reduction brings the company production down to an annual rate of 200 million pounds. It makes the total reduction 110 million pounds annually, or 35 per cent of estimated capacity which the company had attained earlier this year. Two previous 10 per cent cuts were made in April and May.

According to a company statement, since its last curtailment, stocks of unsold nickel in its hands and with the Government have continued to accumulate and now total about 135 million pounds, exclusive of nickel in possession of customers.

The cutback also affects copper, as this metal is contained in the nickel ore mined. Consequently, copper output will be reduced by the same percentage. On this basis, 35 per cent reduction would total nearly 100 million pounds, or 50,000 tons.

## Aluminum Production in Line With Shipments

The present primary production capacity of the domestic aluminum industry is a shade less than 2 million tons a year. Output is presently estimated about 129,000 tons a month, which would indicate about 1,560,000 tons output for 1958.

This is just another case where the cold figures can lead to a misleading conclusion. Most of the inactive capacity represents production potential that was added in 1957, and while some of it has been put into operation, at the same time older and less efficient facilities have been curtailed or halted.

Hence, present primary production is estimated to be no more than five per cent more than is being marketed. While plant inventories remain high, stocks held by producers show little variation from month to month.

## Tariff Controversy

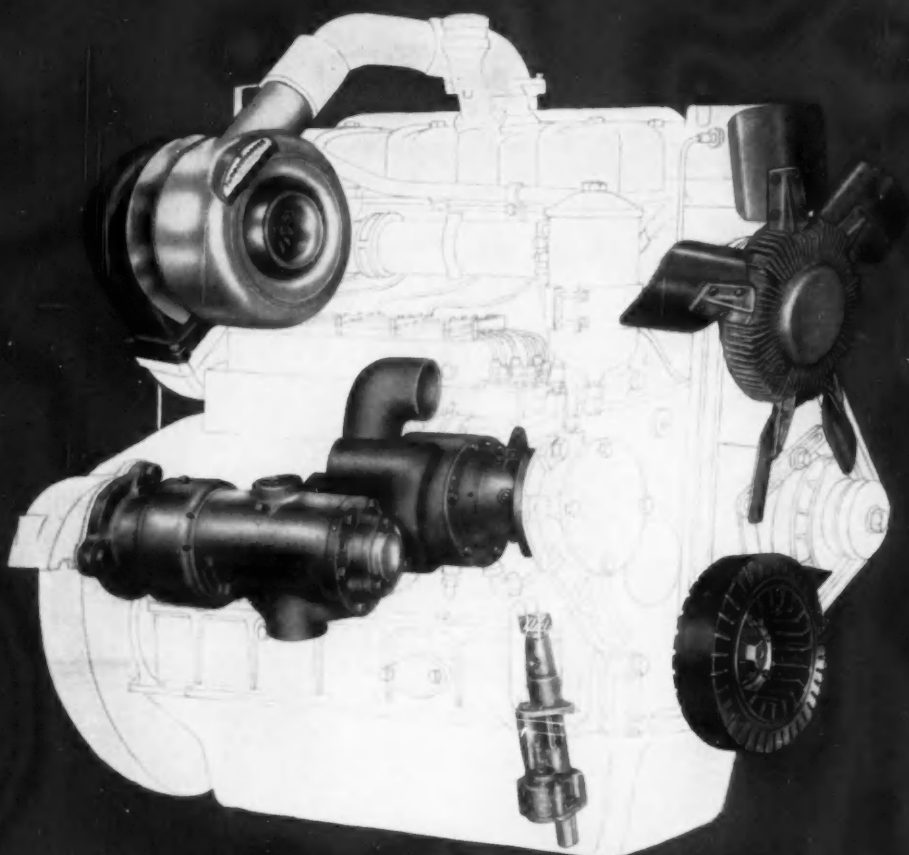
A further development has to do with the violent protests made by the Aluminum Extruders Council in opposing any increase in the present tariff on aluminum imports, and calling for a reduction instead. This, of course, is directly contrary to agitation for a tariff increase, or at least some sort of a price support plan such as is contemplated for copper, lead, and zinc. It is claimed by the proponents that the supports for the other metals are discriminatory unless aluminum is likewise included. The arguments however, appear to have failed to win support at Washington.

## Confused Copper Price

Confusion still reigns in the copper market. Kennecott Copper, the major metal producer, by mid-July was still stubbornly clinging to the established 25 cent price per pound in effect since January. On the other hand, Anaconda, followed soon after by Phelps Dodge, were asking 26½ cents for its metal. Captive fabricators were necessarily pricing their mill products on the metal price of their controlling companies while independent fabricators were prepared to jump to 26½ cents if Kennecott advanced its market. While it is a truism that a two-price market cannot long continue, the present situation has persisted longer than was expected.

It is no especial surprise that  
(Turn to page 84, please)





*Specialists in...*

## FLUID FLOW & VIBRATION DAMPING PRODUCTS

**SCHWITZER**  
C O R P O R A T I O N  
INDIANAPOLIS, INDIANA

TURBOCHARGERS  
SUPERCHARGERS  
FAN BLADES

FAN DRIVES  
ACCESSORY DRIVES  
VIBRATION DAMPERS  
AIR STARTING MOTORS

WATER PUMPS  
OIL PUMPS  
SHAFT SEALS

# News of the MACHINERY INDUSTRIES

By Charles A. Weinert

## NMTBA Presents Case for Machine Tool Makers

*Machine Tool Progress*, Vol. 6, No. 2, dated June 18, 1958, published by the National Machine Tool Builders' Association, forcibly states how Government could "stimulate national business recovery" without additional expenditures, permanent loss of tax revenue, and danger of inflation.

The "outmoded depreciation policy" of the Internal Revenue Service is stated to be the "main retarding factor" in holding back the buying of modern machine tools which can reduce costs and offer better product values. And that "it is this hesitation in replacing obsolete equipment by new productive equipment which is prolonging the recession and putting a brake on recovery." Certain "anti-recession proposals dealing with depreciation policies" are suggested.

The statement also hits at Defense Department purchases of foreign-built machine tools at a time when the American machine tool industry—admitted to be essential for national defense—is depressed.

It is recommended that you read this presentation. If you do not already have a copy, we believe one may be obtained by writing the Association at 2071 East 102nd St., Cleveland 6, Ohio.

## Initial Test Results of "Comapro" Revealed

Jones & Laughlin Steel Corp. has announced some early test results from its participation in the Cone Automatic Machine Company's co-operative machining project known as "Comapro." The project's main

objective is to develop more efficient production procedures and material utilization for the production of machined parts by automatic screw machine.

J&L was selected to supply its Type A leaded steel bars for use in the initial test run of a spark plug shell, as well as in other tests of the series. Stock for the first project consists of 13/16-in. cold finished hexagons, 12 ft long.

Progress reports thus far show that, with full utilization of the free-cutting capacity of Type A leaded steel and other factors, it is possible to increase productivity about 30 per cent over previous machining output for this part. The test showed an index time per part of 4.41 seconds on a spark plug shell, as compared to about 6.5 seconds with conventional shop practices. The free-machining quality of leaded steel also contributes to fine finish and an increase in tool life, and reduces the number of delays for tool changes.

The report further indicates that the use of preset, quick-change toolholders for the nine primary tools resulted in a saving of 37 minutes for each tool replacement cycle over conventional shop practices.

This project, of which Jones & Laughlin is a co-sponsor, is under the direction of the Cone Automatic Machine Co., Inc. It will consist of a series of closely-controlled test runs of various screw machine products, principally those made in large quantities. Cone is contributing a six-spindle Model .TF bar Conomatic and the operating personnel for the tests, which are being conducted at the Cone plant in Windsor, Vt. Other sponsors are providing cutting oil, lubricants, cutting tools, quality control gages,

## NMTBA Publication Sums Up Deterrent to American Industry Buying Modern Machine Tools, and Rec- ommends Governmental Action on "Outmoded" De- preciation Policy


toolholders, etc. The project was officially inaugurated on May 14, 1958. Interested metalworking people are invited to visit the project and witness the tests.

## Around the Industry

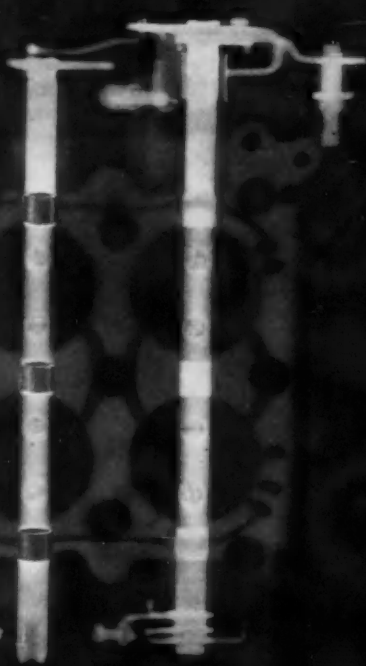
Motch & Merryweather Machinery Co. has acquired the Wink Cutter Div. from F. J. Fink & Co. The Wink cutter is a machine used for cutting rubber, plastic, textile fiber, and other hot or cold extruded materials. Several models of basic cutters, and accessories which can form automatic units for automated extrusion lines, are available. They will be produced at the Euclid plant of Motch & Merryweather. Frank J. Fink joined the company as manager of the division.

Brown & Sharpe Mfg. Co. has appointed William P. Sheffield assistant to general manager of Cutting Tool Div. In the sales department of the Machine Tool Div., new appointments are: James Meehan, assistant to general sales manager; Alfred R. Sparrow, director of grinding machine sales; Walter W. Appleton, director of screw machine sales; and Duncan J. Brown, director of milling machine sales.

Wheelabrator Corp. has formed a barrel finishing and wet blasting division, after having acquired Crandall Engineering & Mfg., Inc., makers of barrel finishing machines. General manager of the new division is Jacob A. Schmidt, Jr., secretary-treasurer of the parent company. George H. Lieser is wet blast product manager, and Roy T. Romine is barrel finishing product manager and chief engineer, with headquarters at Vicksburg, Mich.



*For handling*  
**FRICITION**  
**CORROSIVES**  
**HIGH and LOW**  
**TEMPERATURES**



X-RAY photos show typical uses of Du Pont TFE resins . . . seals in zero-leak check valve and bearings in auto carburetor.

## Here's why seals and bearings of TFE-fluorocarbon resins may be your solution

TFE-fluorocarbon resins have the lowest coefficient of static friction of any solid substance known. Under high loads, coefficients lower than 0.016 have been measured. The resins have practically universal chemical inertness and are rated for continuous use at temperatures from  $-450^{\circ}\text{F.}$  up to  $500^{\circ}\text{F.}$

TFE BEARINGS can operate dry in assemblies where lubrication is difficult or impossible, as the carburetor pictured above. These bearings eliminate "slip-stick" motion and remain unchanged in cold that turns alcohol to

slush . . . cost 1/10th of the bearings they replaced. They perform unharmed in contact with gasoline, oil, grease, and automotive chemicals. TFE bearings can be tailored for high loads, high velocities or high wear resistance by the use of reinforced constructions.

TFE SEALS offer low friction, low torque, ease of operation. As in the valve shown above, they withstand exotic fuels, high pressures and temperatures from near zero Absolute to  $500^{\circ}\text{F.}$  TFE seals are available in all basic designs and configurations.

DISCOVER how you can improve automotive products and production by using seals and bearings of Du Pont TFE-fluorocarbon resins. For product and design information see your local supplier . . . look for him under "Plastics—Du Pont" in the Yellow Pages or write to: E. I. du Pont de Nemours & Co. (Inc.), Room AI 2524, Nemours Building, Wilmington 98, Delaware.

In Canada: Du Pont Company of Canada (1956) Limited, P. O. Box 660, Montreal, Quebec.



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

**TEFLON®**  
 TFE-FLUOROCARBON RESINS

TEFLON is Du Pont's registered trademark for its fluorocarbon resins, including the TFE (tetrafluoroethylene) resins discussed herein.

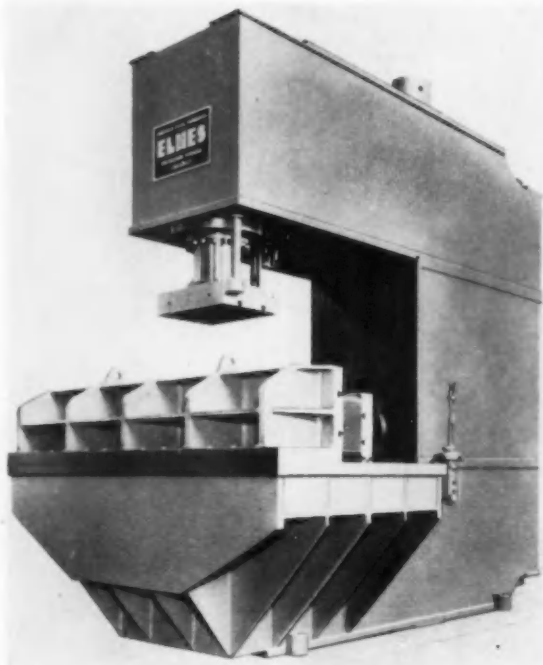
# NEW

# PRODUCTION and PLANT

# EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 69

## Straightening Press And Bulldozer In One C-Frame Unit



This hydraulic press is a combination of a 300 ton C-frame press for straightening work and a 150 ton horizontal bulldozer for forming operations and bulldozing of steel plate. Some of the specifications of the unit are as follows: vertical ram capacity, 300 tons, stroke, 30 in., opening, 54 in. and area of bed is 120 in. left to right and 72 in. front to back. Horizontal ram capacity, 150 tons, stroke, 24 in., opening, 72½ in. and removable resistance head is 120 in. left to right by 24 in. high. (American Steel Foundries, Elmes Engineering Div.)

Circle 30 on postcard for more data

grommets are placed over the valve stems. An inspection is made for faulty valves at station 7, and if necessary, heads are removed, repaired and returned to stations 8, 9 and 10.

Assembly is completed in the remaining nineteen stations including unloading. All parts of the machine are made to interchangeable tolerances for fast, easy maintenance. Construction is to JIC standards and lubrication is automatic. The Cross Co.

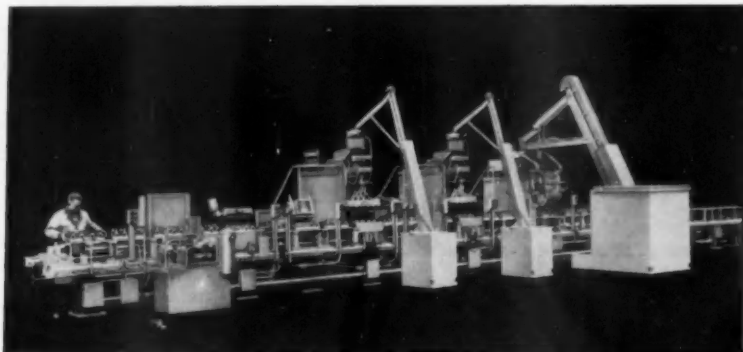
Circle 31 on postcard for more data

## Lathe Tracer Attachment



This lathe tracer attachment is adaptable to virtually all makes of lathes for performing step shaft tracing contour turning and facing operations. (True-Trace Corp.)

Circle 32 on postcard for more data



Cross 29 station machine assembles V-8 cylinder heads at the rate of 310 per hour

## Machine Assembles 310 Cylinder Heads Per Hour

CYLINDER heads are assembled at the rate of 310 per hour in this machine which features a transfer mechanism that lifts and carries the parts

between stations. Castings with intake and exhaust valves in place are loaded automatically at station 1, while at stations 3, 4, and 5 rubber

## Swing Clamp Assembly

SWING clamp assemblies from Jergens Tool Specialty Co. are available in two styles for extreme clamping pressure in close quarters and offer a choice of fastening with socket head screw or nut. Spring loaded shafts permit the clamps to swing quickly and easily out of the way of fixture and work.

Circle 33 on postcard for more data



# ARISTOLOY

## UNIFORM QUALITY FORGING STEELS

This upset forged pinion involved very exacting requirements. Specifications from a large automotive manufacturer called for a clean steel, of uniform quality and exceptional hot forging characteristics. Copperweld's precise melting of selected scrap in electric furnaces, and closely controlled deoxidation fulfilled the customer's demand for cleanliness and uniformity. Careful conditioning and processing before re-rolling developed the exceptional forging qualities he required. The result—another forging problem solved—another Aristoloy customer satisfied.

We will be glad to send you information about the wide selection of Aristoloy forging steels, available in bars, billets and blooms. On special forging problems a Copperweld Field Metallurgist is available for consultation. Write or call today.



New Leaded Steel Catalog now available. Send for your copy today.



**COPPERWELD STEEL COMPANY**  
ARISTOLOY STEEL DIVISION  
4025 Mahoning Ave. • WARREN, OHIO  
EXPORT: Copperweld Steel International Co.  
225 Broadway, New York 7, N.Y.

## Electronic Feed Featured On New Friction Saw



Featuring an electronic feed, this friction saw is designed for cutting structurals, fabricated sections, rails and pipe. Due to its one-piece construction it can be used as a semi-portable unit. A pit is not required. The saw's electronic, variable-torque feed eliminates the need for hydraulic oil lines, pumps and storage tanks. Blade travel into the material is power - screw driven by means of a variable speed motor and a device that automatically varies the pressure as the blade passes through the different thicknesses of structural shapes. (Ty-Sa-Man Machine Co.)

Circle 34 on postcard for more data

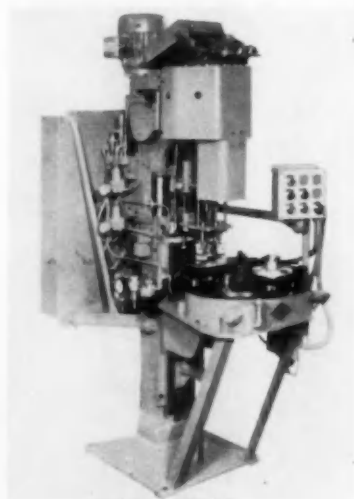
shafts, double clutch of the multiple disk type, V-belt drive from the speed gear box direct to the spindle and adjustable safety devices.

Cycle can be pre-set by means of six multiple automatic stops on the longitudinal travel and on compound cross-travel that interrupt the feed for given lengths and diameters. Controls are centrally located with all dials and calibrations designed for easy reading. Fine feed traverse is determined by precision dials. S&S Machinery Co.

Circle 35 on postcard for more data

## Screwdriving Machine

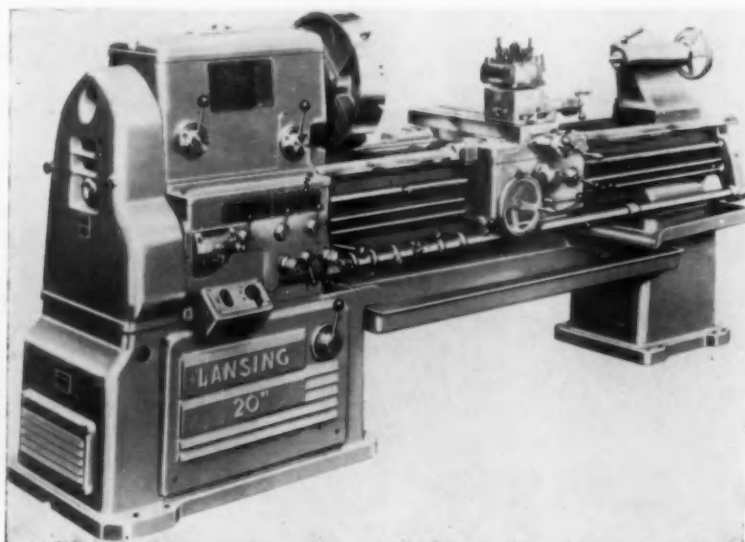
THIS multiple-spindle screwdriver attaches all screws simultaneously. It features individual spindle torque



Gray multiple-spindle screwdriver

control. The machine is for use in applications where high production screw fastening of small parts is required. Parts to be fastened are moved into position by a GEM-17 dial indexing table. Operation is pneumatic-electric using plant air. Gray Equipment Co.

Circle 36 on postcard for more data



Lansing precision toolroom and production lathe manufactured by S & S Machinery

## High Precision Toolroom and Production Lathe

THE Lansing toolroom and production lathe, available in 14, 16, 18, 20 and 22 in. swings, is an extra-heavy-duty machine with a wide range of feeds and speeds.

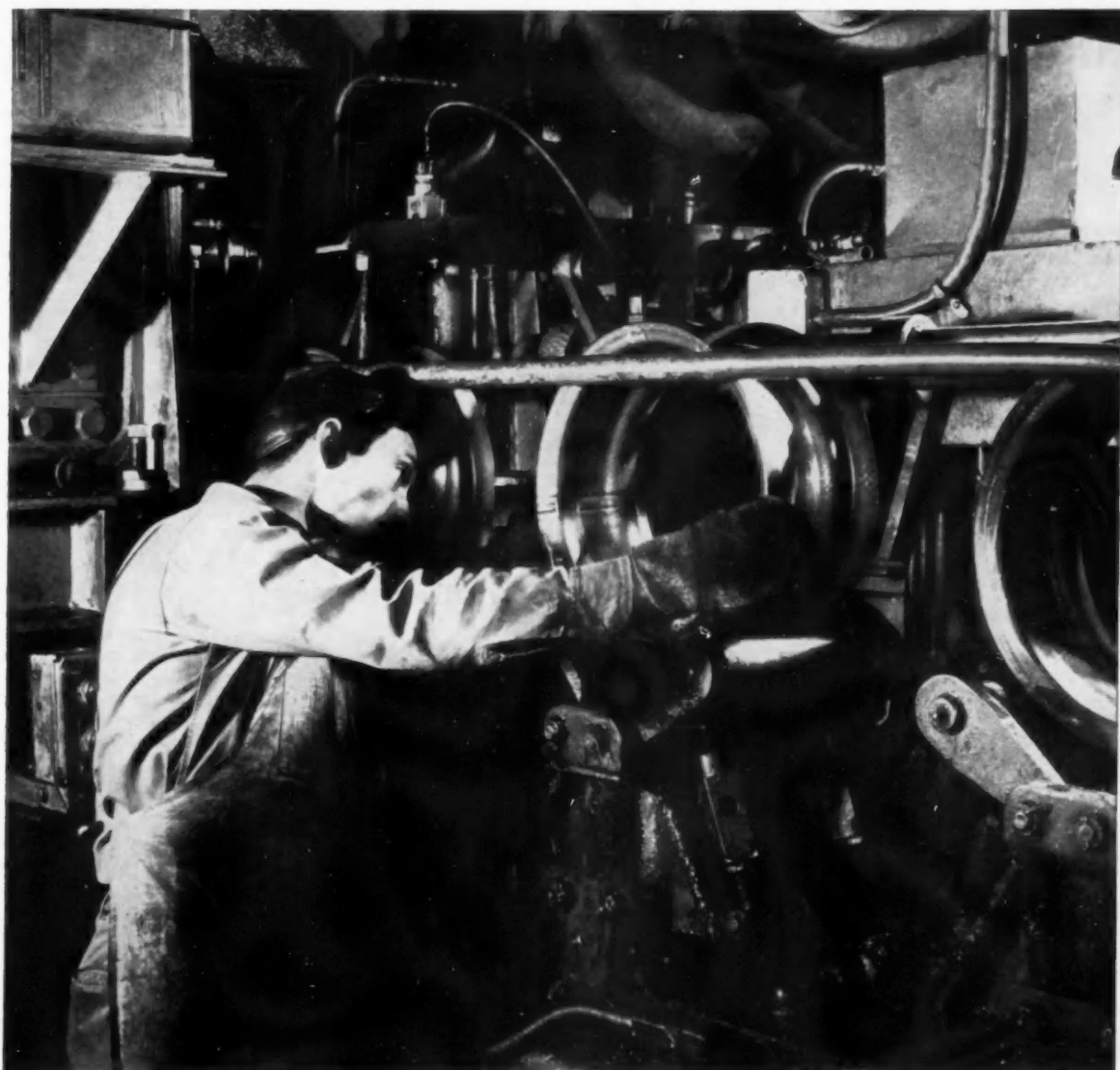
The 20 by 60 in. Lansing shown,

features heavily-ribbed bed and base construction, tapered roller bearings, all gears and shafts hardened and ground, Norton gear box, speed change box with hardened and ground sliding gears on splined

## Automatic Loader, Feeder

MANUAL handling of stock lengths of tubing and round stock can be eliminated by use of an automatic loader and feeder. It will hold 15,000 lb of material and automatically feed the entire load through the machine without any attention from the operator. Grieder Industries, Inc.

Circle 37 on postcard for more data



A workman checks the contour of a wheel rim before it passes to the next, and final, forming operation. Later, the rims will be welded to the hub and drum assembly to make the complete wheel.

## Automobile wheels - a torture test for sheet steel

What a beating the wheels on your automobile must take! And how doggedly they stand up under their gruelling ordeal! Surely this is dramatic proof of the invincibility of strong sheet steel.

But the true torture test of steel sheets takes place in the actual making of the wheels themselves. Take rims for example. Here, the tough, strong sheet must be ductile enough to be spun to the complex contour required. It's no doubt one of the toughest tests imposed on steel sheets anywhere.

Only top-quality sheets—like Bethlehem's—will take such severe punishment with uniform success.

Bethlehem sheets have been formed into hundreds of thousands of wheels for leading makes of automobiles. We'll gladly discuss your sheet steel needs, whenever it suits you. Just call our nearest office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

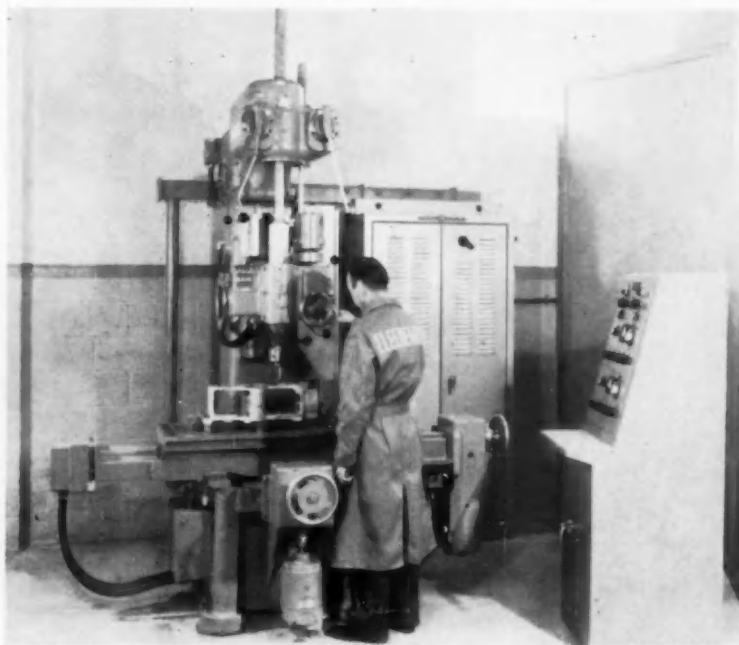
On the Pacific Coast Bethlehem products are sold by  
Bethlehem Pacific Coast Steel Corporation  
Export Distributors: Bethlehem Steel Export Corporation

# BETHLEHEM STEEL



## NEW PRODUCTION and PLANT EQUIPMENT

### Layout Drilling Machine with Numerical Tape Control



Pictured is a Cleereman layout drilling machine equipped with General Electric numerical positioning tape control designed as an accurate drilling and boring machine for tool room work and medium to small lot production runs. (Cleereman Machine Tool Corp.)

Circle 38 on postcard for more data

### 75 Ton Down-Acting Hydraulic Molding Press



This 75 ton down-acting hydraulic molding press offers the advantage of controlled speed of approach with stepless tonnage adjustment from 5 to 75 tons. The hydraulic system is designed to operate on the shop air line. Available with electrically heated or steam heated platens, with water cooled platens and with multiple platen arrangements. Platen working area is 13 by 13 in., with 12 in. of daylight and a 12 in. stroke. Floor area required is approximately 30 by 16 in. (Allied Engineering and Production Corp.)

Circle 39 on postcard for more data

### Vacuum Melting Furnace

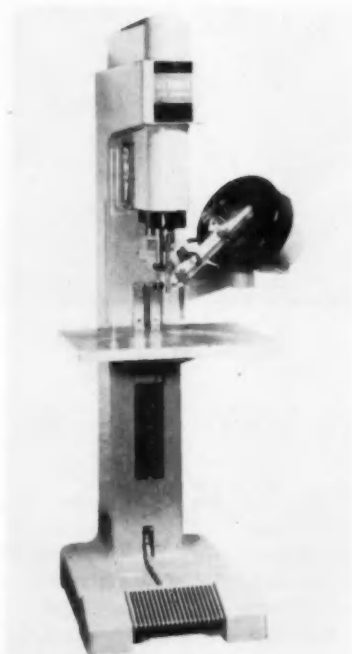
A SERIES of vacuum melting furnaces, with capacities from 17 to 50 lb can be used for operations such as research, materials development, and the production of moderate size parts. Named Model 437-520, the furnaces are delivered as complete "packages." Each has its own vacuum pumping system and is completely wired and piped for immediate installation.

They are capable of handling molds up to 27 in. high and 16 in. in diameter, and of pouring under vacuum in the pressure range of 1 to 5 microns. *F. J. Stokes Corp.*

Circle 40 on postcard for more data

### Power Screwdriver

MODEL U, magazine-fed power screwdriver has a driving range of from No. 6 by 3/16 in. long to No. ¼ by 1½ in. long screws. It has no exposed moving parts, the clutch is adjustable from a minimum of 15 in.-lb to a maximum of 120 in.-lb, holding a tolerance of plus or minus 2 in.-lb, at the lower range to a plus or minus

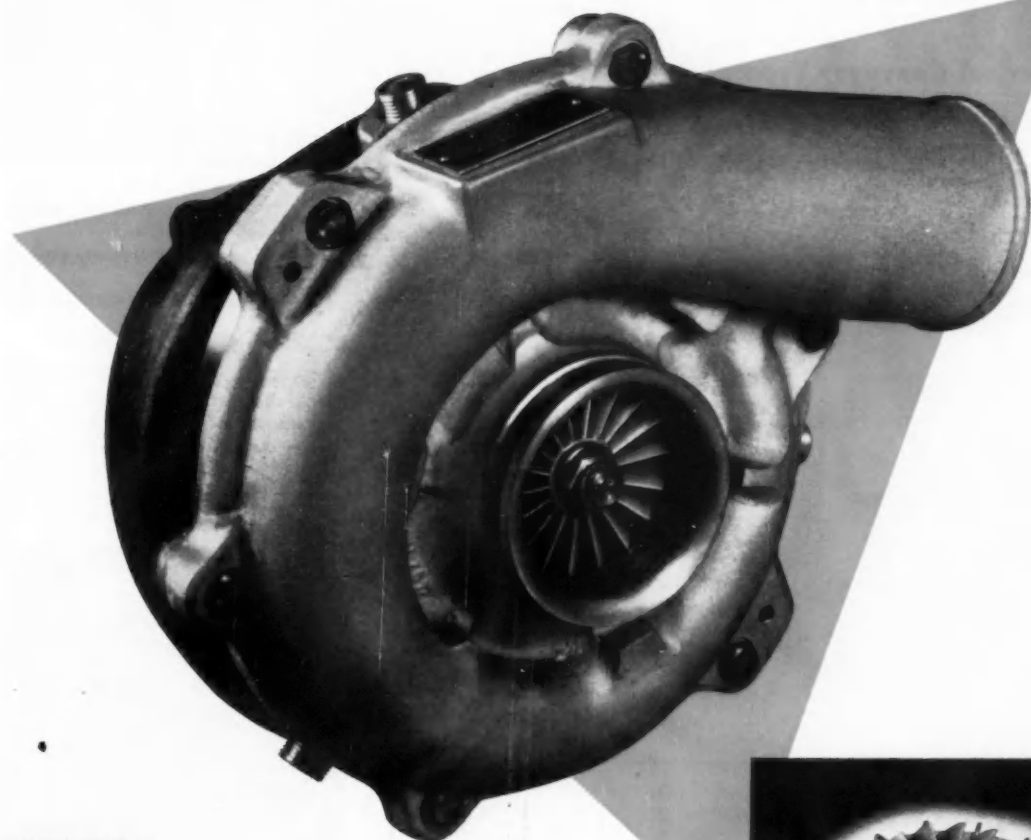


Detroit Model U power screwdriver

6 in.-lb, at the higher range under all normal driving conditions using any standard screw. *Detroit Power Screwdriver Co.*

Circle 41 on postcard for more data





## **NEW!** High-pressure supercharging at low rotor speeds with Thompson Turbocharger

Simple, straight rotor vanes enable the new-design Thompson Turbocharger to produce economical high-pressure blowing of diesel engines even at low rotor speeds. Wear on parts is reduced, maintenance and downtime are kept to a minimum.

In the development labs of the Jet Division, impeller vane contours were developed to make use of Thompson's two decades of experience in high efficiency movement of air and gases.

Other *new* features of Thompson Turbochargers include unique small-diameter shaft and bearing to provide lower shaft surface speeds at equal compression ratios. Bearing and shaft wear is kept to a minimum. In addition, unique Thompson design keeps exhaust heat from traveling to bearings and compressor side of the Turbocharger.

If you build supercharged diesel engines up to 300 horsepower, we can supply a Thompson Turbocharger to provide even more horsepower and fuel economy. If you install diesel engines in trucks or diesel-powered equipment, you'll increase horsepower without increasing engine size by specifying Thompson Turbochargers.

Our sales engineers will help you make the switch to Thompson Turbochargers with practically no redesign of exhaust or intake side. When may they call?



**JET DIVISION**  
**Thompson Products, Inc.**

Cleveland 17, Ohio

AUTOMOTIVE INDUSTRIES, August 1, 1958



Write today on your company letter-head for Booklet AI-858, which contains technical data on Thompson Turbochargers for blown diesel engines up to 300 horsepower.

## Vertical Conveyor Type Washing Machine



This vertical conveyor type washing machine utilizes the space directly above the base of the machine in order to conserve valuable plant floor area. It requires 16 sq-ft of floor space. Work is handled by a separate loading conveyor which carries it to a charging hopper. Then it is fed into a series of perforated flights. During the upward travel of the flights, the work is subjected to spray action cleaning, then the work is discharged automatically into an unloading chute. Overall dimensions are 4 ft wide by 4 ft high by 11 ft high. Production rate is 2000 pieces per hour. (Ransohoff, Inc.)

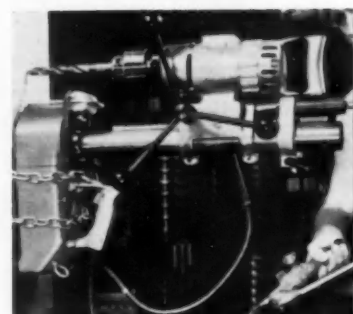
Circle 42 on postcard for more data

two members to be placed closer together vertically. The gear is automatically moved axially from its speeding or cutting position in front of the input magazine to a new position in front of the exit chute when the work cycle is completed. National Broach & Machine Co.

Circle 43 on postcard for more data

## Magnetic Drill Press

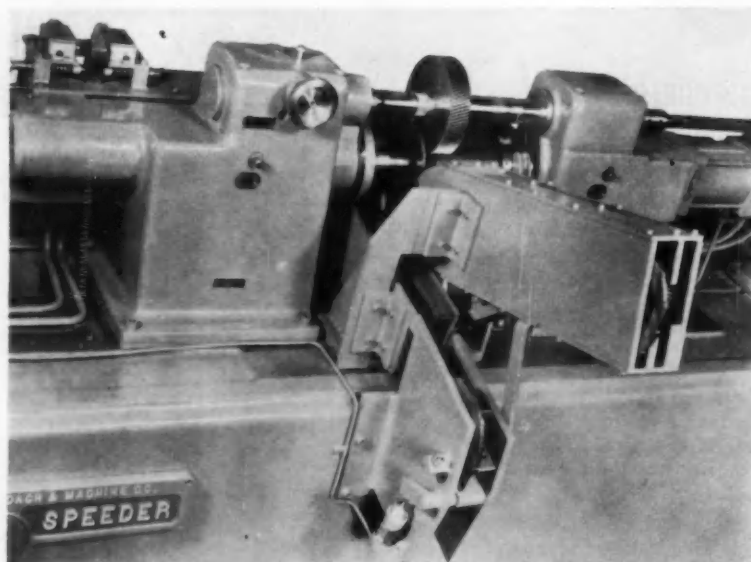
THIS  $\frac{3}{4}$ -in. magnetic drill press, designed for industrial drilling, is tolerance built to drill holes within 1/64 in. accuracy, in continuous operation on either ac or dc current. Among the features of the unit are a drill point locator, two-piece construc-



Black & Decker  $\frac{3}{4}$  in. magnetic drill press

tion, and remote control hydraulic power feed. The drill gives equal performance in either forward or reverse operation. Direction is controlled by means of a positive control reversing switch-ring. Drilling or tapping capacity is 13/16 in. in steel, with reaming capacities in steel up to  $\frac{5}{8}$  in. Length of drill stroke is 12 in. Black & Decker Mfg. Co.

Circle 44 on postcard for more data



Red Ring loader installed on an electronic sound discriminator speeder

## Loader Handles Gears With Large Integral Flanges

A COMPACT, Red Ring rocker-type automatic loader for handling gears with large integral flanges enables a machine having limited clearance between work and master gear, cutter or honing tool, to produce a small gear on a relatively large diam-

eter part. The auto loader can be installed on gear shaving machines, gear tooth honing machines, gear sound testing machines, and electronic sound discriminator-speeders.

The exit chute is adjacent to the input magazine, thus enabling these

## Small Size Die Handler

THE Hansford small size die handler, Model 1018, is of all cast construction giving rigidity and accuracy. The open top platen provides access to the top of a die and any screws entering from the top. Motorization of the vertical movement provides time-saving rapid traverse and the common hand crank for electric switch, manually raises and revolves the top platen. Four lead screw construction, with thrust bearings, allows off center pull, such as in separating two post dies or off center tryout forces of up to 1000 lb. Hansford Mfg. Corp.

Circle 45 on postcard for more data

# Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

## FREE LITERATURE

### Marking Tools 1

The 30 page *Geo. T. Schmidt, Inc.* catalog on marking tools is a simple and useful reference containing many pictures and descriptions of hand stamps, code stamps, lettering dies, knurls, and interchangeable type.

### Controlling Device 2

Specifications of plastic-door miniature recording and controlling instruments are available from *Fisher & Porter Co.*

### Low-Altitude Altimeter 3

The AN/APN-117 low-altitude altimeter which was designed for use on helicopters is described and illustrated in a four page brochure prepared by *Sylvania Electric Products Inc.*

### Press Brakes 4

Bulletin 13-693 covers a line of press brakes. It gives complete specifications on all machines, dimensions and force required to bend mild steel with standard "Air Bend" dies. *The Taylor-Winfield Corp.*

### Ball Bearing Trolleys 5

Ball bearing trolleys and how they work in maintaining the efficiency of trolley conveyors are described in detail in Book 2636, 20 pages. *Link-Belt Co.*

### Metal-Ceramics 6

New metal-ceramics that show promise in the area of high-temperature service are covered in a 12-page booklet which contains physical, mechanical, and chemical properties, and typical applications for these cermets. *Haynes Stellite Co., Div. of Union Carbide Corp.*

### Speed Reducers 7

Booklet B-7238, 10 pages, is an engineering manual which covers selection, hp ratings, dimensions, construction, installation and maintenance for Westinghouse Moduline shaft-mounted speed-reducing units. *Westinghouse Electric Corp.*

### Gravity Conveyor 8

Bulletin RW-58, 16 pages, deals with various applications to which gravity wheel conveyors have been adapted. Construction features and accessories and conveyor selection data are included. *The Rapids-Standard Co., Inc.*

### Machining Titanium 9

A booklet published by Mallory-Sharon Metals Corp. describes the fundamentals of machining titanium. Suggested speeds, feeds and tool angles on turning, milling, drilling, tapping, grinding and reaming are included.

(Please turn page)

8/1/58  
VOID After Oct. 1, 1958  
Circle code numbers below for Free Literature, New Plant Equipment,  
or New Product Information

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## Rubberized Abrasives 11

## Polishing-Buffering Unit 18

**Roller Chain Drives** 12

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# NEW



## TUTHILL POWERMAX

### Hydraulic pumps and Fluid motors

- For pressures to 1500 psi
- Pump capacities from 1.2 to 14.2 gpm
- For speeds to 3600 rpm

TUTHILL, producers of quality pumps since 1927, proudly announces its new line of POWERMAX hydraulic pumps and fluid motors. Produced in a complete selection of seven different models, these rugged, compact new units incorporate the quality construction and advanced engineering that industry has learned to expect from TUTHILL.

POWERMAX pumps and fluid motors use precision-ground, involute spur gears of heat-treated alloy steel, especially designed for efficient and quiet operation. Large, heavy-duty, anti-friction bearings . . . hard, long-wearing, double wear plates of a special bronze alloy . . . double lip-type shaft seals . . . generously proportioned heat-treated alloy steel shaft . . . these are just a few of the many quality construction features which insure long, trouble-free life for POWERMAX pumps and motors.

The compact design of these units saves space and simplifies installation problems. They can be provided for either flange or foot mounting and with either side or rear ports as standard (front porting is available on special order). POWERMAX pumps or motors may be supplied with a built-in relief valve if desired.

**Tuthill Manufactures a Complete Line of Positive Displacement Rotary Pumps in Capacities From 1 to 200 GMP; for Pressures to 1500 PSI; speeds to 3600 RPM.**



#### Duplex or tandem models

For applications such as power steering where two pumps of substantially different operating characteristics are required, POWERMAX pumps may be furnished in duplex or tandem models, with both units mounted on a single shaft. This allows substantial savings through the elimination of a second driving source, reductions in hydraulic piping, and lower installation costs.

A new Catalog, No. 111, gives complete information on these new POWERMAX pumps and hydraulic motors. Included are performance curves, dimensional data, construction features . . . all the detailed engineering information you need. Write today for your copy.

#### TUTHILL PUMP COMPANY

941 East 95th Street, Chicago 19, Illinois

- ☐ Please forward copy of Catalog No. 111 on new POWERMAX hydraulic pumps and fluid motors.
- ☐ Please have your representative call.

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### TUTHILL PUMP COMPANY

941 East 95th Street, Chicago 19, Illinois

PUMPS FOR  
YOUR PURPOSE

# NEW

# PRODUCTS

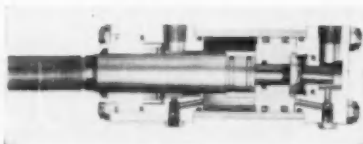
## AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 69

### Air-Hydraulic Cylinders

O-M heavy-duty air and hydraulic cylinders are designed for applications in high-speed automatic production operations. They meet JIC standards.

Series RA air cylinders are available in bore sizes from 1½ to 8 in. and are rated at 200 psi.



Series RH hydraulic (oil) cylinders are available in bore sizes from 1½ to 8 in. also, and are rated at 1000 psi. *Ortman-Miller Machine Co.*

Circle 60 on postcard for more data

### Fuel Pump Package

A hydraulic motor driven vane type fuel pump package has been developed for jet engine starting. It is an auxiliary to the main fuel pump and meets the need for higher starting efficiency.

Vane pump and impeller are driven by a piston type hydraulic motor. Motor speed is controlled by a flow control valve.

The pump is designed to shut off automatically when the main pump takes over and operates on an inlet pressure of 5 psi above fuel vapor pressure and delivers 4500 pph at 150 psi. *Vickers, Inc.*

Circle 61 on postcard for more data

### Light Plane Battery

Exide AC-60 and AC-54 light-plane batteries both incorporate a gas diffusing vent plug which retains electrolyte regardless of flight attitude. The plug has no moving parts. Other features include a plastic container and cover construction, intercell connectors buried and sealed into a polystyrene cover to eliminate shorting

hazards, and a specially processed negative plate. In addition, the batteries feature positive grids of silvium, an alloy with high resistance to electrolytic corrosion, Exide's GOX active material which exposes large amounts of surface area to electrolyte and heavy-duty terminal posts with rugged wing nuts covered with plastic caps.

The low-profile vent plug is made of polyethylene into which is fitted a button-like barrier of specially treated sintered alumina. The plug extends only ¾ in. above the battery cover.

All metal parts are concealed and protected against corrosion and the collection of dirt and moisture.

Available in two models, the AC-60



with 13 plates per cell and the AC-54 with 11 plates per cell, the batteries utilize a container of 9 11/16 in. long by 5½ in. wide and 6 15/16 in. high.

With an electrolytic temperature of 80 F, the AC-60 delivers 60 amps at the 20 minute rate of discharge or 160 amps at the 5 minute rate. With an electrolyte temperature of 0 F, it delivers 160 amps at the critical 3 minute starting rate.

Ratings of the AC-54, with 80 F electrolyte temperature are 54 amps at the 20 minute rate of discharge or 145 amps at the 5 minute rate. The 0 F electrolyte rating is 145 amps at the 3 minute starting rate. *Exide Industrial Div., The Electric Storage Battery Co.*

Circle 62 on postcard for more data

### Solid Epoxy Resins

Three solid epoxy resins, named D.E.R. 661, 664 and 667 have been developed for use in coatings for appliances, auto body primers, cans, drums, tank cars and for industrial maintenance. In addition, they can be used in glass reinforced laminates for aircraft structures, adhesives and electrical printed circuits.

D.E.R. 661 is a low molecular weight resin for catalytically cured coatings, and can be cured at room temperature, or slightly elevated temperatures. D.E.R. 664 is useful in ester type one-component systems needing no curing agent, while 667 is catalytically cured, requiring high baking temperatures, and gives maximum flexibility and toughness. *The Dow Chemical Co.*

Circle 63 on postcard for more data

### Electronic Cooling Package

A line of packaged assemblies for cooling electronic equipment has been developed for application in missile and ground installations. All cooling system components are combined in a single, integral, miniaturized assembly.

The package consists of an electric motor, coolant pump, axial flow fan, heat exchanger, thermal control valve,



relief valve and coolant reservoir. *Pesco Products Div., Borg-Warner Corp.*

Circle 64 on postcard for more data



As an automatic feeding device slides another blank into the die, two DeVilbiss WDB Spray Guns apply a measured amount of lubricant—saving material, protecting dies, reducing rejects.

## THESE SPRAY GUNS ARE SAVING \$18,000 ANNUALLY!

"Applying die lubricants by the DeVilbiss Spray Method has cut our costs for compound, application, and press maintenance *in half*," reports the procurement engineer for one of the nation's largest refrigerator manufacturers. "What's more, malformed and broken parts have been practically eliminated."

"We are currently using the spray method on two 350-ton presses that form the housings for our rotary compressors. Originally, an extra man was required at each press to swab the compound by hand. We also tried dripping lubricant on rollers which transferred it to the

stock. Both of these methods proved slow and wasteful with a high number of rejects.

"Now, by spraying the compound on the blanks automatically with two DeVilbiss WDB Guns, we get the *right* amount of lubricant in the *right* places. The result is a saving in material, fewer rejected parts, and fewer interruptions to remove 'breakouts' from the die. Downtime for press cleanup has also been substantially reduced."

If your manufacturing process involves the application of die lubricants, it will pay you to check the advantages of the DeVilbiss Spray

Method. Call our nearest branch office for full details, or write: The DeVilbiss Company, Toledo 1, Ohio.

### THE DEVILBISS COMPANY

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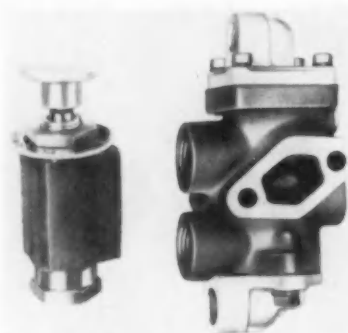
FOR BETTER SERVICE, BUY

**DEVILBISS**



## Air Brake Valves

Wagner Electric Co. is offering air brake protection valves of improved design. The emergency brake valve,



mounted in the tractor cab, provides "push-pull" manual control. It may be operated manually at any time to isolate tractor braking pressure and to trigger the trailer brakes in the event of an emergency.

The tractor air line protection valve, used in combination with the manual control, is installed into service and emergency air lines leading to the trailer, replacing individual hand-operated shutoff cocks. In the event of a pressure loss on the trailer or a breakaway, it automatically isolates the tractor air supply, allowing normal control of tractor brakes.

Circle 65 on postcard for more data

## Pressure Tubing

Volume production of prefabricated assemblies is now available to reduce costs on Nylaflo tubing applications. Nylaflo pressure tubing is a flexible polyamide having uses in hydraulic, lubrication, pneumatic and instrumentation lines. *The Polymer Corp. of Penna.*

Circle 66 on postcard for more data

## Explosive Bolts

A line of explosive bolts including fragmenting and non-fragmenting bolts and their associated bolt cartridges has been designed for use in applications such as multi-stage separation, nose cone separation, missile launcher release and jettisoning of wing tanks and fuel tanks.

Explosive bolts consist of special or standard bolts with provisions for an integral or separately installed high explosive charge. Maximum

safety is achieved by prior installation of the bolt into the structure to be separated, then arming it by installing the high-explosive cartridge. The point of bolt separation or failure is very accurately controlled. *McCormick Selph Associates.*

Circle 67 on postcard for more data

## Fractional HP Pump

Designated as model 420-D, this fractional hp water and liquid circulator is engineered to handle water and non-corrosive abrasive fluids in industrial applications.

Featuring corrosion resistant bronze and stainless steel construction in all of its wetted metal parts, it has one inch threaded intake and discharge connections, handles linepres-



sures up to 150 psi, and fluid temperatures up to 230 F. *Fostoria Pressed Steel Corp.*

Circle 68 on postcard for more data

## Laminated Plastic

A laminated plastic that retains strength after exposure to high temperatures known as Phenolite Grade GH-871 is made of glass fabric combined with a special high temperature resisting phenolic resin.

Designed for short time, very high temperature applications, such as parts for guided missiles or rockets, the material retains more than 95 per cent of its strength after 1/2 hour exposure at 500 F. *National Vulcanized Fibre Co.*

Circle 69 on postcard for more data

## Miniature Couplings

A line of miniature flexible couplings has been developed for use in close tolerance applications. Six dif-

ferent sizes comprising the complete line have been designed to eliminate all backlash and transmit uniform angular velocity at high speeds. They are available in phosphor bronze and beryllium copper.

A hydraulically formed seamless metal bellows is employed as the heart of the coupling to reduce bearing wear and excessive friction caused by misalignment of shafts. They may also be used to dampen vibrations. *Bridgeport Thermostat Div., Robertshaw-Fulton Controls Co.*

Circle 70 on postcard for more data

## Aluminum Casting Alloy

Kaiser Aluminum & Chemical Sales Co. has developed a high-purity aluminum casting alloy combining high tensile and yield strengths with good ductility after heat treatment. It is readily adaptable for use in highly stressed aircraft and missile structures, high velocity blowers and impellers, and other uses where high yield strength is of prime concern.

Circle 71 on postcard for more data

## Pressure Switch

The 900Q0 Series pressure switch, designed by Hydraulic Research and Mfg. Co., features an intermediate mechanical snap action that insures trigger switching of the electrical switch element. This prevents welding of contacts that ordinarily result from contact chatter.

Available in pressure settings from 5 to 4000 psi, it is suitable for use



with hydraulic fluids or compressed air. Weights vary from 0.25 to 0.40 lb.

Circle 72 on postcard for more data





## Nature's Torture Chamber proves Skinner Solenoid Valves can really take it!

Our laboratories put each Skinner Solenoid Valve through every conceivable test, but the real proof is given by trucks, buses, and farm, construction and materials handling equipment in all areas of operation—in the cold of the Rockies, the heat of the desert, the splash of rain and dirt, and the shock of rough roads in normal service.

Each day thousands of standard and specially designed Skinner Solenoid Valves are performing in the main arteries of hydraulic and pneumatic systems—controlling pressure—and vacuum-operated mechanisms. **They** do their jobs without a falter.

These valves are not only the finest you can buy, but they offer exceptional conveniences and safety features. Such features as stainless steel internal parts, soft syn-

thetic inserts and spring-loaded plungers assure long life without fear of leakage or sticking. The valves are bubble-tight and designed to permit mounting in any position. UL-approved coils, standard or waterproof, will last indefinitely.

You'll find many profitable uses for Skinner Solenoid Valves—to control the operation of cylinders, diesel racks, clutches, brakes, governors, transmissions; in heating, refrigerating, truck and passenger car air conditioning, fuel and air suspension systems—just to name a few.

If you have a control problem, write us at Dept. 338 and we will put an engineer to work solving it today.

Remember, Skinner Solenoid Valves are "built to take it," whether the going is smooth or tough.

Consult your Classified for the Skinner Factory Representative nearest you.



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# SKINNER

**ELECTRIC VALVE  
DIVISION**  
NEW BRITAIN  
CONNECTICUT  
105 EDGEWOOD AVENUE

## Automotive Plastics

(Continued from page 47)

spread application in convertible rear windows and in the aftermarket for transparent seat covers. Vinyl sheeting is also being used in the 1958 Ford and Mercury for door panels, in the Buick, Chevrolet, Ford, Edsel, and Chrysler as crash pad coverings, and on certain models as upholstery material by several manufacturers. Breathable

Naugahyde (U. S. Rubber Co.) is a well-known material that combines the durability, stain resistance, and other advantages of the vinyls with air circulation for added passenger comfort.

Due to the many types of grained finishes and other embossed treatments in which vinyl sheeting can be obtained, an almost infinite array of decorative effects is now available in car interiors. Many manufacturers use a layer of vinyl sheeting over the metal dash-

board and instrument panel to provide a non-marring, non-reflective surface. The 1958 Ford Thunderbird is a good example of the use of vinyl-to-metal on the transmission housing, certain areas of the doors, dashboard, and as a crash pad substitute. Vinyl tape is used on some cars to back up the rear view mirror to prevent glass from flying out of the metal frame in a collision.

Vinyl, along with urethane, foams are finding applications in seat topper pads, crash pads, arm rests, etc. An interesting new use of vinyl foam is found on the Edsel, where a grommet-like fixture around the steering column is one piece of chemically blown foam covered with a plastisol skin (see illustration).

The vinyls are at home on the exterior of the car and under the hood as well as inside. Typical molded or extruded parts are window weatherstrips, spark plug nipples, battery and radiator drain tubes, wire coverings, etc. Increased usage for such applications can be expected.

Closely associated with the vinyl plastics are the vinylidene chlorides which have been given the generic term "saran." Resistant to most acids and alkalis and unaffected by most solvents, they are noted for their low water absorption and dimensional stability. As an extrusion, saran is used as a seam welt filler for upholstery applications. A relatively new usage is a gasoline filter made from woven saran cloth.

### New Materials

The chemical industry is said to expect that 15 per cent of the large future increase in plastics production will be in materials that are not even commercially available today. Various new thermoplastics with outstanding impact strength, durability, thermal characteristics, etc., are definitely in prospect. Probably the most imminent are the new polyolefins such as special polyethylenes and polypropylenes; the former were discussed previously.

A thermoplastic with a high softening point, Pro-fax (Hercules Powder Co.) is one of the new poly-

(Turn to page 79, please)

QUALITY

QUALITY

QUALITY

QUALITY

UNEQUALED/QUALITY



## TULSA<sup>®</sup> POWER TAKE-OFF

Years of engineering mastery, manufacturing experience and tough field testing have proved the unequalled quality of Tulsa Power Take-Offs. Precision-made . . . compact . . . powerful, durable and quiet . . . Tulsa Power Take-Offs are foremost with these outstanding features . . . shaved and heat-treated gears, hardened shifter yokes; anti-friction bearings throughout; strong, lightweight heat-treated aluminum housings . . . extremely low prices with nationwide distribution and service. Tulsa assures you unequalled quality in Power Take-Offs sized from single speed, medium duty to multiple speed, heavy duty models.





## OSTUCO SWAGED TUBING ups aircraft parts production 82%

Hogged out of a shaped forging, this vital aircraft part in SAE 4140 took 400 minutes to machine.

So the producers, The "Special" Corporation, brought their problem to Ohio Seamless. The solution—an Ostuco Swaged Tube.

Now the chips are down . . . and so is machining time. Down to 220 minutes—a saving of 180 minutes per part—with a whopping 82% increase in parts production per workshift.

Chances are Ostuco Tubing can put you on velvet, too. The first step is to contact your nearest Ohio Seamless sales office, or the plant at *Shelby, Ohio—Birthplace of the Seamless Steel Tube Industry in America.*

AA-8112



Photo: Courtesy The "Special" Corporation, Brooklyn, N. Y.



**OHIO SEAMLESS TUBE DIVISION**  
of Copperweld Steel Company • SHELBY, OHIO

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

SALES OFFICES: Birmingham, Charlotte, Chicago (Oak Park), Cleveland, Dayton, Denver, Detroit (Huntington Woods), Houston, Los Angeles (Lynwood), Moline, New Orleans (Chalmette), New York, North Kansas City, Philadelphia (Wynnewood), Pittsburgh, Richmond, Rochester, St. Louis, St. Paul, St. Petersburg, Salt Lake City, Seattle, Tulsa, Wichita. CANADA: Railway & Power Engr. Corp., Ltd. EXPORT: Copperweld Steel International Company, 225 Broadway, New York 7, New York.



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**STYLING**

*Skillful*  
**ENGINEERING**

*Careful*  
**MANUFACTURING**

*Dependable*  
**CONTROL**

**KING-SEELEY CORPORATION**  
ANN ARBOR, MICHIGAN

## AUTOMOTIVE HARDWARE

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Ammeters  
Fuel Level  
Oil Pressure  
Special Purpose  
Temperature  
Volimeters

### GOVERNORS

"Serve" Mechanical—Diesel  
Handy  
Vari-Speed-Velocity  
Visible—Action

### INSTRUMENT CLUSTERS

### INSTRUMENT PANELS

### ODOMETERS

### REGULATORS, CONSTANT VOLTAGE

### SERVO MECHANISMS (Heater Control)

### SIGNALS

Fuel Warning  
Oil Pressure Warning  
Oil Level Warning  
Special Purpose  
Speed Warning  
Temperature Warning

### SPEEDOMETERS

### SWITCHES

Delay Relay  
(Ride Control)  
Inhibitor  
(Automatic Shift)  
Oil Pressure  
Special Purpose  
Temperature

### TACHOMETERS

8096



## Automotive Plastics

(Continued from page 76)

propylenes. Light in weight, the new hydrocarbon polymer is resistant to heat, chemicals, moisture, and stress cracking. Automotive applications under consideration include: air cleaner, air conditioner, brake reservoir, fan, and heater housings; dome light bezel and lens; fuel lines; steering wheel; shock absorbers; coil forms; knobs; headliner; air suspension tubing, etc.

Both in this country and abroad progress in plastics technology is



Ball joint socket liner for front end suspension made of Pyroflex (trademark) thermosetting plastic (Equipment Sales Div., Raybestos-Manhattan, Inc.)

moving ahead on all fronts. Three brand new high heat-resistant thermoplastics have already been announced in the U. S. While these materials are not available as yet in production quantities, they are being evaluated for many applications. These new plastics are:

1) Delrin acetal resin, developed by Du Pont and set to go into commercial production in mid-1959, is a high-melting, highly crystalline, thermoplastic polymer. It is made by polymerizing formaldehyde in an n-heptane solution with a catalyst such as nickel carbonyl. Delrin has an excellent combination of properties—high strength; outstanding resilience; remarkable toughness; good abrasion, chemical and solvent resistance; dimensional stability; and low coefficient of friction. Potential automotive applications include: instrument cluster housings, carburetor and fuel pump castings and covers, squirrel cage blowers, interior hardware,

and certain bearings, bushings, and gears.

2) Lexan is the trade name General Electric Co. has given to a new family of aromatic polycarbonate resins. Generally made by condensing bisphenol A with phosgene, the resins are being evaluated as molding compounds, films, extrusion compounds, coatings, fibers, and elastomers. Molding compound is the form furthest toward commercialization. The material has advantageous electrical properties, heat and oxidation resistance, dimensional stability, and impact strength. It may well find applications in automotive gears, cams, bushings, and other parts.

3) Penton, trademark of Hercules Powder Co. for its new polychloroether resin, is prepared from pentaerythritol and hydrogen chloride, using borontrifluoride as a catalyst. It has outstanding chemical resistance, excellent dimensional stability, good electrical properties, and can be molded in conventional injection and extrusion equipment. Potential automotive uses include: air conditioner, automatic transmission, carburetor, power steering pump, generator, and water pump parts; printed circuit for dashboard electrical assembly; speedometer, window regulator, and windshield wiper gears; and steering gear assembly.

It is still too early to forecast the impact these new plastics may have upon the automotive and other industries. In time to come, they may replace plastics of lesser heat resistance or be used in parts where no synthetics are found today. Plastics have made giant strides in the automobile industry because of their inherent potential for variety of form, color, texture, and ease of application. Due to their ability to replace complex and expensive assemblies with simple molded units, they have contributed important cost savings in the manufacturing process. There is every reason to believe that the car of tomorrow will contain many new and fascinating decorative and functional plastic parts.

**AUTOMOTIVE INDUSTRIES  
KEEPS YOU INFORMED**



## IN FASTENERS SOUTHERN IS plated

For plated screws that assure corrosion resistance and beauty, you can rely on Southern's better finishes in plated nickel, zinc, cadmium, brass, copper, statuary bronze, blued or black oxidized screws. All of these are finished in our own plant to rigid specifications. Chromium plated brass wood screws, machine screws and nuts, and hot galvanized steel wood screws are stocked in all popular sizes.

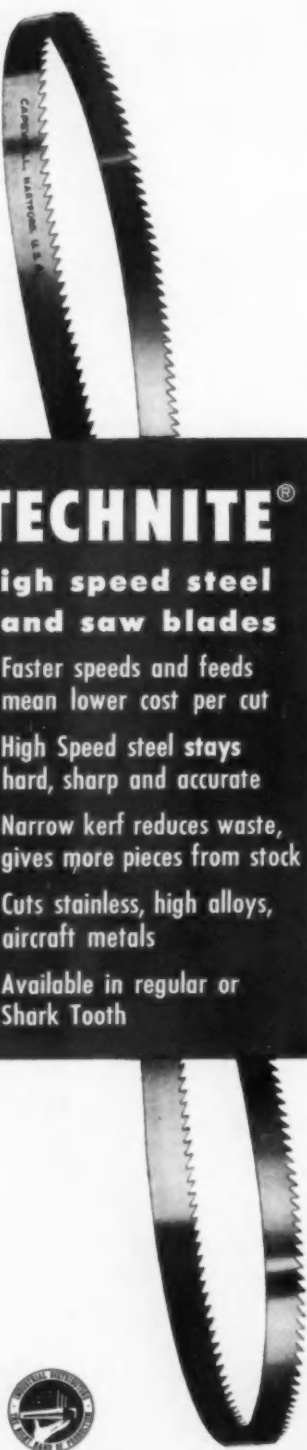
Southern's cadmium and zinc plated fasteners are treated for extra brightness and corrosion resistance with IRIDITE® chromate conversion coating. This also makes the screws suitable for painting without additional treatment.

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**CAPEWELL**

THE CAPEWELL MFG. CO.  
 HARTFORD 2, CONN.

## Missile Conference

(Continued from page 51)

### Almost 100 Per Cent Reliability

In discussing the problems of missile manufacture and the urgent need for specialization, E. W. Schening, Burroughs Corp., touched on the Atlas guidance system which enabled the Atlas to go through 250 consecutive simulated guidance runs to completion without error. Recently two Burroughs computers for the SAGE system were tested under actual field conditions for 11 weeks. After 1848 hours of operation the availability of the AN/FST-2 was logged at 1844 hours, a reliability of 99.8 per cent.

From the standpoint of sub-contracting for Atlas at Burroughs, outside purchases account for about 30 per cent of the contract. There is a total of some 300 vendors and sub-contractors and small business accounts for 63 per cent.

### Evaluating Sub-Contractors

Aerojet General Corp., according to Carl H. Warren, uses vendor evaluation teams in appraising sub-contractors, due to the need for narrow specialization. At the present time they are carrying about 1600 qualified and approved sub-contractors, excluding commercial purchase sources. Around 80 per cent of all outside procurement goes to small business.

### Missile Production at Chrysler

Missiles systems reliability remains the largest factor to be considered. Unless reliability is close to or at 100 per cent, the missile system is pretty much a liability. This phase of the subject was explored by B. J. Meldrum, Chrysler Corp. Since the usual criteria of statistical quality control and even 100 per cent inspection are not sufficient to provide the degree of reliability that is required, Chrysler has adopted some basic atti-

(Turn to page 82, please)

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**United  
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Plastics Division of  
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## Missile Conference

(Continued from page 80)

tudes in dealing with the Redstone and Jupiter.

1. Designs must be conservative. In the present state of the art, they can say to a designer "Do this over, you have used up more than your share of weight." But they have not yet reached this stage with respect to reliability.

2. High quality manufacturing with quality built-in, not inspected-in. They employ all applicable quality controls, quality surveys, quality audits, etc. And follow with extensive functional testing. Nothing is inspected less than 100 per cent; while most assemblies will have from 800, 900, to 1200 per cent inspection when you take into account all of stages from making a component, to sub-assemblies, and assemblies.

3. Finally, there is the feedback value of field support. When field difficulties are encountered they are fed back through all of the members of the team for corrective steps.

### High Percentage of Engineers

Speaking of the missile airframe, M. Rosenbaum of Convair, said that his company employs in engineering a ratio of one person to every 1.5 in the rest of the organization. While this is partly due to the limited requirements of numbers for large missiles, even doubling of the production force would not change the ratio materially.

### Inertial Guidance Systems

A review of inertial guidance systems was made by Moreton B. Price, AC—Electronics Div. The AC system is considered to be one of the best means for providing an accurate, simple system that answers all of the requirements of the missile. It is completely divorced from earth, requires no external in-flight checks, is free from interference or jamming by natural or man-made means. Price also emphasized that this inertial guidance device is more accurate than any known system made outside the USA.





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49 lb. manifold



Core for  
50 lb. valve



160 lb.  
radiator tank



## METALS

(Continued from page 58)

demand has been on the light side during the month which simply reflects the seasonal pattern when the Connecticut Valley fabricators are shut down for vacations. Of quite a lot of interest is consideration by the Chilean Government to sell copper direct to the Soviet Government, shipping direct to Vladivo-

stock and by-passing Continental Europe. This move, if consummated, might strengthen the London market and bring prices on the London Metal Exchange in closer relation with New York, tariff or no tariff. The Russian Government acknowledges it is short of copper at least temporarily, in pleasing

contrast to its efforts in dumping surplus aluminum and tin on world markets.

Left to its own resources, even without stockpiling or subsidies, copper will work its way out because of the determined efforts here and abroad, to bring down mine output to meet demand. Much progress has been made, and it is now generally agreed that surplus production, if it exists at all, is of very small amount. It appears now that while orders from customers have not materially increased, the rate of shipments has been accelerated. While inventories of raw copper may be replenished rather slowly, inventories of finished products are likely to take larger quantities of metal in August and September.

### Zinc Industry Still Depressed

The badly depressed condition of the domestic zinc industry was plainly indicated by publication of the June statistics. Stocks of metal on hand increased another 12,300 tons during the month and now stand at the huge total of nearly 253,000 tons, a figure not seen since 1945.

As some compensation, production of slab was reduced about 4000 tons to 67,000 tons for the month, representing a cut of nearly 20 per cent since January. But even with this the production exceeded shipments by 12,300 tons, indicating the vital need for still more reduction if supply and demand are to be balanced. Shipments for Government account have been suspended since June.

### Lead Stocks Increase

Lead producers are in no better position than zinc miners. Smelters' and refiners' stocks of metal increased to a total of 141,000 tons according to the latest estimate. This represents a new high in the current upward trend and is the highest level for 20 years. Business has been very moderate even at the 11 cent price. It is significant that an abortive attempt to raise the price  $\frac{1}{2}$  cent late in June failed to last more than a few days before it was reduced to the old level.

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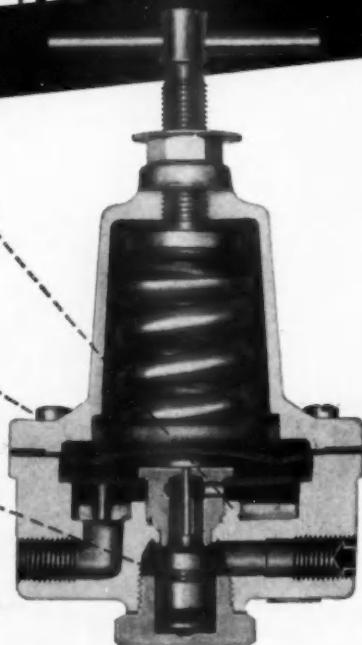
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Automobile manufacturers will be required to display a suggested retail price on their new lines of cars next Oct. 1, or when a manufacturer introduces a new model, whichever is later. Cars leaving the factories must bear a sticker showing suggested retail price of the car; suggested prices of accessories; transportation charges; make, model, and serial number; final assembly point; and the means of transportation to the dealer.

Manufacturers excise tax does not apply to a self-powered grain or feed loader-unloader, often moved by highway vehicle. In its new Revenue Ruling 58-332, Internal Revenue Service finds that the loader-unloader is not an automotive part or accessory. IRS says also that a special one-wheel trailer on which the loader-unloader may be mounted is not a taxable highway vehicle.

Army generals are trying hard to convince the public that the Air Force is unable to bear the entire load of missile development and operation. To prove "superiority" in missiles, the Army is conducting a series of demonstrations for manufacturers and newsmen.

Government lending to smaller firms is now a permanent Washington policy. Under the provisions of new legislation signed into law recently by President Eisenhower, the Small Business Administration (the Government's multi-million-dollar lending agency) is now in business to stay. The new law also prescribes 5 1/2 per cent as the maximum interest rate to be charged on government loans to small firms. Up to now, the maximum rate has been six per cent. Also, the new law increases from \$250,000 to \$350,000 the maximum amount set for any one borrower.





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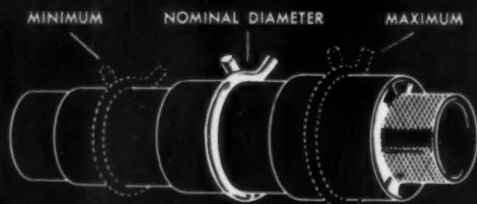
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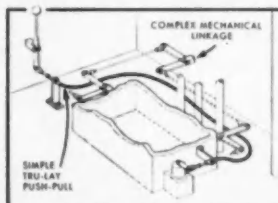
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HOSE CLAMPS**

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